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A COMPLETE GUIDE FOR COACH PAINTERS.

TRANSLATED FROM THE FRENCH OF

M. ARLOT,
COACH PAINTER,

FOR ELEVEN YEARS FOREMAN OF PAINTING TO M. EHERLER
COACH MAKER PARIS.

BY

A. A. FESQUET,
CHEMIST AND ENGINEER.

TO WHICH IS ADDED

AN APPENDIX,

CONTAINING INFORMATION RESPECTING THE MATERIALS AND THE
PRACTICE OF COACH AND CAR PAINTING AND VARNISHING
IN THE UNITED STATES AND GREAT BRITAIN.

PHILADELPHIA:
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PREFACE TO THE AMERICAN EDITION.

THE volume here presented to the American public, but more especially to the coach painters, varnishers, and builders of the country, consists of the work of M. Arlot, a French coach painter of many years' experience in Paris; with, in addition, a valuable mass of material touching the practice of the profession in the United States and Great Britain. The additions thus made to M. Arlot's treatise have been by permission mainly drawn from "The Hub, a Journal for the Carriage and Car Shop," published in New York, and most judiciously and ably edited by Geo. W. W. Houghton, Esq., of whose kindness the undersigned here desires to make special and particular acknowledgment. Not only has Mr. Houghton with great liberality freely granted the use of the matter in the pages of his journal, but he has also given suggestions in regard to the selections to be made, and in addition carefully supervised the passage of this portion of the book through the press. The publisher is fully sensible of the great value which these American additions give to the volume.

One more point remains to be touched upon. The undersigned cannot in justice to his own feelings withhold an expression of the pride and satisfaction with which he as a friend of American Industry welcomes the day on which he is able to print such facts as are here given in regard to the successful establishment of the manufacture of the finer qualities of varnishes in this country. The industries are the mile-stones along the grand highway which leads to true Civilization, and National Power and Independence—a road which we are now steadily travelling in spite of the chilling and paralyzing influences of putting in practice theories in regard to the currency and the finances of the country since the close of the war, which are not so sound, judicious, or statesmanlike as might have been. Even with this very serious drawback, the policy of building up a thoroughly diversified industry vindicates itself day by day and hour by hour to every American of broad and liberal views, and unselfish mind, and good judgment. The work which Messrs. Valentine & Co., of Cambridgeport, Mass., have accomplished under protection is a most important one, and they are in the truest and best sense of the word public benefactors, who merit and should receive the thanks of the American public, and especially of that portion for whom this book is intended.

HENRY CAREY BAIRD.

PHILADELPHIA, 406 Walnut St., Jan. 3, 1871.

AUTHOR'S INTRODUCTION.

THIS little book is not presumed to be a work on art; we simply offer to our readers a practical manual for the use of coach painters. We have not undertaken a general treatise on painting, but merely the study of the theory and practice of one of the numerous branches of the art of painting.

Indeed, does not the art of painting reach all over the vast distance which begins with the modest stone painter who restores the color of our houses, and ends with the masterpieces of the historical or portrait painter?

The coach painter, we are proud to say, occupies an honorable place in the legion of men who deal with colors.

Undoubtedly, whatever be his own merit, the coach painter will gain by applying theoretical principles to practical use. A methodical manual becomes therefore indispensable. Indeed, how many conditions are to be fulfilled, how many qualities are to be acquired in order to arrive at the perfection of our art? If inspiration is essential to the artist, knowledge makes the skilful worker, and merit is the result of work and study. It is not sufficient to execute, we must do the work within certain conditions of durability and stability; hence the necessity of a full knowledge, not only of the manner of employing the substances, but also of their properties before and after they are applied. We well know the amount of care required for preparing and grinding the colors, and we have yet to consider all the numerous conditions, necessary in the various branches of our art.

Although coach painting is a specialty, it may be divided into ten distinct parts, which are: I. Grinding; II. Preparing; III. Pumicing; IV. Levelling; V. Polishing; VI. Striping; VII. Varnishing gears; VIII. Mending; IX. Painting groundwork; X. Varnishing bodies.

It is a fact that those who have acquired perfection in each of these parts are few; and we must infer that any one who will have mastered each of these specialties equally well, and who will feel himself able to do the entire paint work of a carriage, if he is not an artist, is certainly very much like one.

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MANUAL FOR THE COACH PAINTER.

CHAPTER I.

NEW BODIES.

Article 1.

Foundation or Filling Coats with Fatty Oils.

WITH materials of the first quality, such as whitelead and oil, we obtain good foundation coats.

To a mixture of linseed oil (two-thirds) and essence of turpentine (one-third) add three parts of yellow ochre washed, but still very dry and in fine powder, and to the paste obtained, one part of whitelead, which it is best to have in kegs from well-known houses. There is economy in doing so, and less danger of falsification.

The mixture is effected in a bucket. We thin it gradually with turpentine, and try to avoid the formation of lumps. It is better to add dryers just before use, because dryers added some time previously will produce glossy coats, while their employment immediately before laying on the coats gives a dull or dead color.

This composition for filling coats possesses a great deal of stability. However, for cheap work, the proportion of whitelead may be reduced to a twentieth; some painters do not use it at all; others add a certain quantity of pumice-stone in order to expedite the subsequent pumicing. I must say that I have tried the last process, and do not recommend it.

◆

Article 2.

Hard Filling Coats (Rough Stuffs).

These kinds of coats are employed only in certain cases where haste is necessary, because their preparation is very costly, and, notwithstanding their appearance, they do not possess the same stability as the previously indicated coats.

There are three compositions for hard filling coats; but we shall examine only the first, the other two being devoid of the necessary stability.

Grind separately lump whitelead with essence of turpentine, and do the same with unwashed yellow ochre; then mix the two pastes in the proportion of three-fourths of whitelead and one-fourth of ochre. Allow the mixture to stand exposed to the air or to a gentle heat in order to evaporate the excess of liquid, and add gradually small portions of good drying oil, taking care to stir and beat the mixture well with a brush, as in distemper painting; the paste thus acquires more body.

It is possible with this composition to give three coats in a day's work; but, after the last coat we must wait forty-eight hours for a thorough drying. We may then putty up, lay a guide coat, and pumice.

◆

Article 3.

Laying Priming and Filling Coats.

Priming coats being the foundation of good painting, need all our attention. When a body is ready for the painter, he should remove all the dirty spots on the panels with a rag moistened with turpentine, and then dust off. Afterwards, he must lay a coat of white lead ground in linseed oil, thinned with turpentine, and with a very small quantity of dryer. This first coat must have plenty of oil in it, so as to fill the pores of the wood. If the body contains coffers and leather parts, the panels and the inside of these coffers must also receive a coat of whitelead ground in turpentine, to which a little linseed oil and a dryer are added.

When this first coat of whitelead has well set in, the filling coats (whitelead and ochre) may be applied. However, in order to obtain the best results, it would be well to give a second priming coat of whitelead, somewhat poorer in fatty oil than the former. One coat is sufficient for the leather panels and the inside of coffers. When the leathers are fast, two coats of the same whitelead are necessary, but they should be applied only on perfectly dry material, otherwise the dampness will granulate the whitelead, and cause the loss of a coat.

The first priming coat is laid on the inside of bodies when the outside receives the second coat. But for the inside the residues of paints and inferior turpentine may be employed.

As it sometimes happens that, after the priming, the bodies remain a certain length of time without receiving a filling coat, it is necessary, before laying the latter, to scrape the surface to be painted with sand paper and to thoroughly dust it off.

Six filling coats are generally sufficient for the woodwork, ten for the grain side of leather, and as much as sixteen for the flesh side.

I strongly recommend, unless there is an absolute necessity to the contrary, the laying of a filling coat only every other day in summer, and every three days in winter, and to follow each one in succession regularly. These are afterwards allowed to harden, and then we may putty up, lay a guide coat, and pumice.

◆

Article 4.

First Puttying Up and Guide Coat.

The filling of holes and dents in bodies is made with a varnish putty (see Art. 7), and all the defects and irregularities of the filling coats are, at the same time, to be carefully puttied up. We must also putty the edges of dormer-windows where there are leather panels, and the recesses in the mouldings of the Custolde panels, in order to avoid the swelling up of the leather by dampness.

When the body is puttied up, mix red ochre with very limpid turpentine, a certain proportion of linseed oil, and just enough dryer to obtain a dead coat. This coat is called the guide coat, because it guides the workman in pumicing equally all over, which he could not easily do otherwise, and this process saves time.

◆

Article 5.

Pumicing or Pouncing.

Although this is entirely handwork, it presents certain difficulties and requires experience and especial care. Few men do this work perfectly well. It is necessary to supervise the workmen when they use pumice-stone; some of them, in order to hurry up the work and save labor, employ coarse stone, hence we have imperfect work, without economy for the employer, and it often requires another complete dressing, and impairs the stability of the under coats. We must therefore use a pumice-stone of medium coarseness and grit, light, and the grain of which is firm.

When the workman pumices the leathers, it becomes indispensable that the water should not remain longer than is necessary upon the panels, so as not to swell the leather. We must therefore work from the top downwards, and dry the panels well as soon as finished.

Very often, on leathers, we meet with certain roughnesses which, if pumicing were continued on these places too long, would result in holes difficult to mend. We must stop as soon as these become white, and the defects may be remedied with a coat of hard filling stuff.

A good pumicing requires plenty of water, a thorough washing afterwards, and a careful drying with the chamois skin.

◆

Article 6.

First Disguise Coat (*Gray Lead*).

After pumicing, the body is allowed to dry completely before any coat is laid upon it. The carvings are deprived of the excess of paint by a knife or a piece of glass, then pumiced with turpentine instead of water, and dusted, and afterwards puttied up with Japan or gold size putty. The hollow parts of the body are cleared in the same manner. At last, when the body is well cleaned, the putty on the carvings is smoothed down with fine sand-paper. After dusting, a coat of gray lead (dark lead), not too rich in oil, is laid on, followed and levelled as well as possible.

This coat, which we call the disguise coat, is useful in this only, that it helps the last puttying up and levelling; but it will entirely disappear during the last operation, if the filling coats are irregular in thickness or the previous pumicing is not done satisfactorily.

On the other hand, if the filling coats have been well levelled down, this disguise coat will serve as a groundwork.

The sashes and doors should be treated in the same manner as the panels of the body.

◆

Article 7.

Putties—Last Puttying Up and Pumicing.

We employ four kinds of putty, which are: I. Varnish putty, hard, made with whitelead or zinc white; I prefer the latter, because it does not require to be ground, and becomes thoroughly incorporated with hard varnish. A certain proportion of yellow ochre is added during the mixing up, which aids the operation of pumicing. This putty is employed for the first puttying up. II. and III. Patent putties (*au procédé*) made with zinc white or flake white, and mixed with a composition of Japan with gold size or drying oil; these putties dry instantaneously. IV. Oil putty, known everywhere, and made with good linseed oil and very dry whiting. This putty may be hardened by mixing with it a little varnish.

When the coat of gray lead is perfectly dry, all the defects should be filled up with varnish putty laid first on the deepest parts, so as to give time for hardening; afterwards a new quantity of putty is pressed in again, in order to fill the cavities completely.

A great deal of care is necessary in employing this putty; an excess is objectionable, and it must be left to harden until the following day before using the pumice-stone.

For hurried work we employ the patent putty, and pumice almost immediately.

The final levelling of the panels requires the greatest care, and we avoid producing scratches by the use of small smooth pumice-stones. When the panels have been properly treated during the first pumicing, the coat of gray lead will be scarcely touched; but in the opposite case, the last dressing with the pumice-stone will be deep and will remove the gray lead, which we must avoid. The workman in charge must deliver up his job in a state of perfect cleanliness.

Monkey Seat (Culs de Singe) Panels.

This panel must receive a single priming coat, and should be pumiced with turpentine after the body itself has been pumiced. Immediately after, it should be puttied up with the patent putty, which is smoothed down with water, and then sand papered. Give two coats of gray lead like that employed for the gears, and, after smoothing, fill the inequalities with the same putty, and dress it level with water and pumice-stone. The under part of the coffers and where the wheels pass, are treated in the same manner. This work is made at the same time that the body receives its disguise coat, is puttied up and pumiced.

Article 8.

The Body Itself.

The painter's work on the body itself is, in my own judgment, that which requires the utmost experience, skill, and brains on the part of the workman in charge.

A very careful examination is necessary to ascertain whether certain defects are to be remedied, such as filling up the holes left by nails, or those occasioned by too deep pumicing on leather panels. This filling up is made with the patent putty, which is to be levelled with pumice-stone and water, and lastly, the whole body must be sand papered lightly enough so as not to scratch the panels. After this operation, the body is well dusted and receives a coat of light lampblack.

Article 9.

Laying Transparent Colors in General.

We call glazing (*glacer*) the laying of transparent colors upon more opaque ones, the shades of which blend harmoniously.

Blues.

In order to have these colors reflecting pleasantly, we must prepare the groundwork or body coats as follows: When the body has been pumiced or sand papered, give it a first and very thin coat of whitelead ground in linseed oil, mixed with Prussian or Flora blue, which has been incorporated with turpentine and a small proportion of dryer. For the second coat, the addition of ordinary ultramarine will darken, and at the same time, brighten the former composition. Afterwards, transparent coats of ultramarine blue should be laid on.

Many painters are in the habit of grinding this blue under the muller, but I believe that it is more advantageous to stir and beat it, because the friction of the muller upon the stone imparts to it a greenish tinge.

The ultramarine blue is therefore pounded thick with turpentine, thinned with linseed oil, to which very little dryer is added, and it is kept somewhat oily in order to make it run more easily when used. A small proportion of whitelead is mixed with this color, so as to blend harmoniously with the coat underneath, while the next coat should be richer in ultramarine. The tone of any other following coat will be regulated by that of the preceding ones; and three of such transparent coats will be sufficient for a very fine blue.

The other shades of blue are obtained in the same manner except that a lesser number of transparent coats is necessary. A very dark blue can be produced only by laying a transparent coat of pure ultramarine upon a ground of ivory-black.

Lakes and other Colors.

Transparent coats of lakes are applied upon several colors, such as brown, ivory-black, lamp-black, red, and blue. The least satisfactory of these coats is the one which is to be laid upon blue in order to obtain a violet shade; but as this color has no durability, it is seldom in demand.

Brown shades are very often required, therefore we will pay more attention to them. As with the blues, the shade wanted must be regulated by the color of the groundwork. All brown colors ought to be prepared with powdered Van Dyck brown mixed with lampblack and turpentine, to which is afterwards added, some drying oil. This coat must not be too glossy. These browns mixed with lampblack have a richness of tint which cannot be obtained with ivory-black; however, if the shade is to be extra dark, the transparent coats must be laid upon ivory-black.

The transparent coats upon the blue ground of various shades are very difficult of execution, because the true color does not immediately appear; therefore these transparent coats must be light and rich in oil, and four coats are necessary in order to arrive at a satisfactory result.

The colors for these transparent coats are prepared as follows: All the lakes must be ground very fine, by putting under the muller a portion not larger than a hazel-nut. The paste is made by the addition of linseed oil and turpentine to the powdered lake, already mixed with turpentine and varnish, and a little dryer when the weather is damp; but in hot weather linseed oil may be substituted for a part or the whole of the varnish.

For transparent coats upon a red or very light brown ground I recommend the use of carmine or English lake. Carmine lakes are those generally employed, and the first quality is not always needed.

These kinds of transparent or glazing coats possess very little durability; they whiten by washing or even polishing. In order to avoid this inconvenience we must lay over five or six coats of very good varnish.

Glazing coats are also laid upon green grounds of various shades, and when applied upon a greenish-gray ground, not too dark, a very rich shade will be obtained. However, these transparent glazing coats are seldom entirely satisfactory, and are very expensive; their demand is, therefore, limited. They are ground the same as the lakes, with the exception that the grinding is effected with oil alone, and turpentine is added afterwards, but no dryer. This glazing dries so rapidly that a very skilful workman has scarcely time to lay it; consequently it must be very thin for use.

We have now to pass to the coats of Japan varnish, which, in coach painting, are scarcely laid on any other colors except blacks. But I have been obliged to deviate from the habit of certain painters who apply it upon lampblack; in this case three coats at least are necessary in order to obviate the sweating of the black, and each coat is to be pumiced with water, otherwise the next coat will not get a good hold.

Japan varnish does the best with ivory-black, and one coat is sufficient. Still we have to pumice and take the gloss off before varnishing, and we cannot prevent it from becoming greenish when the varnish is laid on. The best result with Japan will be obtained as follows: Mix it thoroughly with a certain proportion of ivory-black very finely ground; the coats must present a half gloss, but at the same time too much dullness must be avoided, because they would be wanting in hardness, and the subsequent varnishing would soften them.

One coat only of such a Japan glazing, laid upon a ground of ivory-black, will give a very fine black.

◆

Article 10.

Laying on Rubbing Varnishes.

Before the varnish is laid on we must be very careful to ascertain if it becomes well adapted and incorporated with the coats underneath, which is often not the case in cool or wet weather. If the varnish does not cling well, a sponge moistened with a mixture of linseed oil and turpentine should be passed over the paint.

However, in very cold weather, this process may not be sufficient, and then we use a wet rag dipped in fine pumice-stone, with which we rub all the parts to be covered with varnish.

This operation blends and unites the substances together, and prevents the enamelling of the varnish. The surfaces having been thus prepared and well washed, the first coat of varnish is laid on. This coat must be thin and must flow easily, because too rich a varnish cannot be well spread, and will form ridges, stain light-colored grounds, and turn the blacks and blues green.

This first coat should be allowed to dry for two days, if possible, and be then rubbed with pumice dust and water. As soon as it is dry the second coat is rapidly laid on with pure varnish; the work will be aided if plenty of varnish is employed taking care to avoid runs and gatherings.

I shall dwell longer on this subject when speaking of the varnishes.

After the second coat the varnish is allowed to harden as much as possible. Two coats of rubbing varnish, laid properly, are sufficient for a body; however, when we desire perfection, a third coat, not too thick, becomes necessary after the body has been thoroughly polished.

◆

Article 11.

Polishing.

This work ought to be confided only to careful workmen, who are known to concentrate their entire attention on what they have to do. It consists in levelling and smoothing all the parts of the body by means of powdered pumice-stone and water, rubbed with a woollen rag. With a light-colored ground a grayish rag is advisable.

Before spreading the pumice-stone upon the panels the operator must make a searching examination of the work to ascertain whether certain defects exist, such as blotches, runs, pits, &c., and if such are found they must be rubbed off with a small and light pumice-stone, having a soft grit.

Afterwards, pumice-stone dust of medium fineness should be spread over the panels with a rag folded in four. The pressure must be light at the beginning in order not to scratch. When the grains of the stone have been reduced to about half of their size it is useless to add any more, and the polishing is finished with the quantity already on, keeping the rag constantly wet.

I would here remark that it is preferable to leave some irregularities of level rather than to run the risk of taking off the varnish and even the paint; the repairs would be very difficult, and an altered varnish gives a flat appearance to the work. A well-washed body shows the attention of the operator.

If it happens that some portions have been ground too deep, the person having in charge the mending work should immediately be advised, so as not to cause delay.

◆

Article 12.

Mending and Fixing.

This work also requires attention and brains on the part of the workman, who should examine all parts of the body. If the doors rub, the rubbing parts are scraped with a piece of glass. The inside of the coffers are painted; the irons are sand-papered, and receive two dull coatings of ivory-black; the mouldings are cleared, smoothed, and painted twice if we use ivory-black or any other dull color. In general, the same workman makes all the small repairs, lays pure japan on the painted irons, and sets and binds all junctions in mouldings with the drying Sœhnée varnish. When all this is done, the rabbets are varnished, and the irons japaned wherever wanted.

We see in this article that the clearing and painting of mouldings and hollow parts is made after the first coat of varnish; to do so before would be lost time, because during the polishing the sharp edges are more or less reduced.

An excess of varnish in the hollow parts imparts a greenish tinge, that on the sharp edges will become softened and tacky by the varnish put on afterwards, and falling on the panels will spot them with specks.

◆

Article 13.

The Last Varnishing.

The last varnishing is not the most difficult part of the coach painter's work, but it certainly requires the utmost care. As the finishing varnishes are always of the best quality and very fat, they are more easily laid on than the rubbing ones; but, on the other hand, it is very difficult and sometimes impossible to repair defects. (For particulars on varnishes see Chapter XII.)

When the body has passed through all the operations of the preceding article, and is dry, it is put into the drying-room, the entrance of which should be interdicted to every person not having to work there, because it often happens that the workmen in charge are made responsible for all accidents which may happen. This room should always be exposed to the north, so as to have a constant temperature of from 75° to 80° Fahr. until the varnish is hard.* If the day succeeding the varnishing is damp, we must avoid the exposure of the body to the air, which would cloud the varnish.

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* The object of this is to avoid as much as possible the excessive heat of summer—the cold of winter being, of course, more under control by means of artificial heat.—*Trans.*

CHAPTER II.

NEW RUNNING GEARS OR CARRIAGE PARTS.

Article 1.

Priming and Sand-papering.

ALL new gears receive a white or gray priming coat, according to fancy, and are generally sand-papered with the addition of essence of turpentine.

Whitelead, when used for the priming coat of gears, may be the cause of many accidents, and for the sake of the health of the workmen, it should be substituted by ordinary zinc-white, which, independently of being innocuous, does not require to be ground. This priming coat is only a guide, as it is afterwards entirely removed by sand-paper, therefore we may use a cheaper white than whitelead. It is laid on with not a great deal of linseed oil or turpentine, so as not to grease the sand-paper too much.

The smoothing is done with sand-paper with the addition of either turpentine or water. As the last process is no longer in use, I shall not dwell on it.

The use of turpentine is objectionable in two respects: First, I have often ascertained that the essence penetrates the paint of the wood and makes it loose, especially at the hub. Second, it is well known that the essence is unhealthy, and I have known several persons who had their hands paralyzed by too frequent use of turpentine.

We shall, therefore, speak of the dry sand-papering, which is now generally adopted, and is in our opinion the best. The sand must be well glued on the paper, be of medium number, and the whole be not too brittle. The sheet should be seven to eight inches square.

The portions which require a good sand-papering are the faces, the flat parts, the felloes, the hubs, the spokes, and wherever the wood is porous.

The irons and stays need only to be free from greasy substances, and all the paints which may be upon the irons should be removed with a knife. The hubs, on account of their many edges, may be sand-papered with the aid of turpentine, but we must avoid any infiltration between the spokes.

Article 2.

Disguise Coat.

After sand-papering, the gears are cleaned and dusted previous to the first coat of gray lead, also called the disguise coat, which is prepared as follows: Whitelead ground in oil, lampblack, a little varnish, No. 3, and a very small proportion of dryer. A good supply of oil must be employed, so as to fill the pores of the wood, and no ridges be left. When this coat is dry, the flat parts of the springs are puttied up with the patent putty, which must be pumiced or sand-papered before the second coat of gray or dark lead is laid on. This second coat is less rich in oil. However, in some cases, one coat is enough; in other cases, when perfect work is desired, three are necessary; but, on an average, two coats are necessary.

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Article 3.

Puttying and Levelling.

It is very important to allow time for the complete hardening of the coats of gray lead, because otherwise the upper coats having been laid on with less oil, would have a tendency to enamel. For a hurried work, it is preferable to apply one coating of gray lead only.

The next operation consists in levelling or rubbing; that is to say, in passing the sand-paper all over the gear work, in order to smooth down the coat of gray lead, and remove the excess of fatty substances. After dusting, putty is put on where needed, avoiding those places which may shrink or expand when the carriage is in motion. It is useless to color the putty.

When the gears are puttied up and dusted, they immediately receive a coat of lampblack, which prevents the hardening of the putty. A hardened putty would result in irregularities of surface, which would be very troublesome to remedy after polishing. The soft putty is smoothed down at the same time that the coat of lampblack is laid on with a badger brush.

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Article 4.

Varnishing.

Practice alone will teach the manner of varnishing. I will only state that, should it happen that the colors refuse to hold the varnish, the process indicated in Article 10 of the chapter on New Bodies must be followed.

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Article 5.

Polishing.

The remarks on polishing bodies apply equally well to gears. Before polishing, the varnish should be hard; but it happens too often that we cannot wait. The portions of the gears which require the most polishing are the faces, the spokes, and the flat parts of the springs; the remaining portions are only dulled, because they become levelled and glossy enough when the finishing varnish is skilfully applied.

The polisher must wash the gears thoroughly, and not a particle of pumice-stone must be left on them when they are ready for striping.

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Article 6.

Striping.

Striping is the most agreeable part of coach painting, nor is it difficult for a person somewhat skilled in the use of the brush. For this kind of work, artistic taste rather than skill is needed.

The colors for striping are prepared either with linseed oil, or with turpentine and varnish, or drying oil. When varnish is used, there is the advantage of rapid setting; but, on the other hand, the colors may become softened by the action of liquids.

Drying oil will also cause the colors to dry rapidly, but it is difficult to use.

The above liquids are advantageous for hurried work; however, if time is allowed, a finer result will be obtained with linseed oil.

Article 7.

Finishing Varnish.

The application of the finishing varnish to the gears requires as much care as on bodies. For the colored parts which require a light mending, or a few finishing strokes, we employ drying colors made so by using what remains in the pots of the colors used for the gears, and stirring it with a small proportion of gold size. Colors for striping are also prepared with essence and gold size.

All these small repairs are made fast with the Sœhnée varnish, which does not soften the colors, and dries immediately.

CHAPTER III.

OLD CARRIAGES PAINTED AFRESH.

Article 1.

Bodies.

For this kind of work, the main condition is to ascertain exactly what is the actual state of the old paint. If there are cracks or blisters, we must examine whether they go as far as the foundation coats, by scraping a small portion of a panel with a knife and pumicing afterwards. Should it happen that the filling coats are not sound, then all the old paint must be burned off by means of the furnace arranged for the purpose, and new coats laid on.

The greatest caution must attend the burning off of the leathers, because it happens almost always that they become so expanded by heat that they separate from the wood-work.

If, on the other hand, the paint is sound, and only the varnish is altered, the panels should be rubbed with aqua ammonia, which will temper the varnish into a paste which can be removed with a wide putty knife. Care must be had not to alter the filling coats. The pumice-stone is next used, and we must avoid scratching the paint with it. After the doors, corners, and mouldings have been cleaned with a knife made for the purpose, a coat of gray lead is laid on, and when dry, all of the defects are puttied up with Japan putty. Now the painting goes on as for a new body, with the exception that the coat of rubbing varnish may be substituted by a mixture applied the day before the finishing varnish is laid on.

This mixture is made of wearing varnish, half turpentine and a small quantity of dryer, and may be employed for new bodies in the case of hurried work.

If black panels are not too much deteriorated, the defects may be mended with ivory-black, covered with a transparent coat of Japan varnish, and the whole made fast with varnish.

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Article 2.

Gears.

First scrape those parts requiring it; afterwards, if a dark paint must be laid upon a light one, or conversely, it will be indispensable to scrape off all the irons, to clear all joints, and to sand-paper thoroughly, otherwise the new paint will scale off and show the old one.

Therefore, after a priming coat, the gears must be entirely sand-papered so as to smooth down the projecting parts and remove the fat gloss of the paint. A dull surface is necessary to blend and unite the two paints, which cannot be done except by polishing.

Next to sand-papering, a good coating of gray lead is laid on, and when this is dry, puttying succeeds. If the color must be dark, a first coat of lampblack is applied. One coat of the desired color and a light one of varnish laid on with a badger brush are sufficient. Indeed, it is a well-proved fact that the less we overload our old paints, the more we gain in durability, without detriment to the appearance when the work has been properly performed.

CHAPTER IV.

VARNISHING BODIES AFRESH.

THERE are some difficulties in the application of varnish upon old paints. It is difficult to have it to dry rapidly without clouding, and to prevent the showing of the repairs.

However, I shall explain to my readers the processes which I have found to succeed the best, during an experience of forty years.

It is usual, when a body is stained, to clean it with poppy-seed oil; but this oil is thick and tacky, and penetrates the paint, which renders the drying of the varnish difficult.

To obviate this inconvenience, a thorough polishing is required, previous to which, we smooth down with a small pumice-stone all the rough parts, such as nail holes filled with putty, and the old varnish. After this preparation, the small repairs to the colored parts are performed, and made fast with the Sœhnée varnish. As these parts are bright, it is easy to graduate and harmonize the tints with the shade of the groundwork. It is prudent to begin on a portion of the body, wait until the paint is dry, cover it with the Sœhnée varnish, and then judge of the effect.

All the colors for the mending work are prepared with drying gold size, and must be somewhat glossy in order to dry quickly. The making fast with the Sœhnée varnish may be done the same day. If, on the next day, the work is not dry, it is washed with essence of turpentine, and another setting is applied with more varnish in it.

This work must always be done in a dry shop. All the black panels, as soon as ready, are set with Japan varnish.

It happens quite often that we find cracks in the leather panels, due to the natural shrinkage and expansion of the wood; we must then, with a knife, make incisions in these parts while they are dry, and give them a priming coat of gray lead followed by another of hard filling stuff. In this manner, these parts are ready to be pumiced when the body passes to the hands of the polisher.

CHAPTER V.

VARNISHING GEARS AFRESH.

The preparation of the gears is nearly identical with that of the body. The defective parts are scraped off, then sand-papered and covered with a coating of gray lead. When this coat is dry, all the excess of grease of the old paint is removed with pumice-stone and water, at the same time that all roughness is smoothed down. The undried grease is removed with a rag dipped in turpentine. Finally the gears are perfectly clean.

For finishing the repairs, all the scraped parts must be smoothed with sand-paper, and an oil putty mixed with a small proportion of varnish, is applied wherever necessary, with great care not to allow it to form thicknesses above the level of the work. If the faces of wheels are scaly, all the cavities must be filled immediately after scraping, with the patent putty, so as to be ready for pumicing during the polishing process.

In order to obtain a perfect varnishing, it is necessary, after a careful dusting, to make fast the under parts by a coat of drying varnish mixed with half the quantity of turpentine. It is handy to use two cups and two small badger brushes; with the latter we lay the varnish in the corners and recesses, while the larger brushes are employed for the remainder of the work.

We must lay on this coat thin and with a light hand, in order not to temper and soften the putty. The larger surfaces to be mended, need two coats of paint, and while the first coating dries, the small repairs are made.

If the colors are composed of substances having an earthy consistency, such as ivory-black, dead leaf green, &c., the large portions to be painted receive a coat of lampblack, or, in the case of light colors, a kind of compromise color made with fine materials which will approach as much as possible the color desired.

When many small repairs happen to be collected on the same spot, the whole must be painted at the same time, applying the color thin. In such case, it is preferable to mix the colors with dryer, so that they will not be softened when the varnish is spread upon them.

In regard to the ornamental striping, I sincerely believe that a compromise between the owner and the painter, allowing an entirely new striping, will be mutually advantageous. The former, without greatly increased expense, will have work looking fresh and quite new; the latter's pride as a worker will be satisfied.

The last stage is the varnishing in the usual manner, but I must particularly recommend the employment of the best quality of varnishes upon old work, for the sake of durability and appearance.

CHAPTER VI.

HALF PAINTING WORK.

FINE carriages are rarely painted by this process; however, it may happen that carriages which have never been in use, must be changed in color. The preliminary work is the same as when varnishing afresh, but the colors and varnishes must be of the first quality. The colors should be rich in oil, so as to prevent the under coats from drying and scaling off the upper ones. As this sort of work is rarely paid up to its value, it becomes important to do it quickly and with economy. The utmost cleanliness is necessary, and one coat of color with one of finishing varnish (English No. 2) is sufficient. Two days after, the polishing is proceeded with, and one fixing coat of varnish thinned the day previous with turpentine, is laid on, then a last coat of English finishing varnish is applied. We have always obtained good results by this process.

The gears require only the above fixing coat upon the paint, before polishing.

CHAPTER VII.

PAINTING BODY FOR EXTRA HURRIED WORK.

I AM about to indicate the process which I have employed for carriages belonging to the household of the Emperor Napoleon III.

Put the body upon trestles in a clean room, dry, and heated during the winter. If the body has received the filling coats, pumice it as usual; but if it has a priming coat only, sand-paper the panels, and make ready a filling coat prepared with lump whitelead ground with half and half of linseed oil and turpentine, to which is added a small proportion of yellow ochre tempered with a little rubbing varnish and dryer. This coat must not be glossy at all. Lay four coats of this filling, two every day, altogether two days. These coatings must be rubbed perfectly smooth.

The third day, in the morning, putty up carefully with the patent putty. Three or four hours afterwards, the puttied parts and the body must be pumiced, taking care not to reach the wood.

When this is done, prepare the body as usual for receiving the coloring.

If the intended color is dark, a color of a compromise shade is prepared, in which there enters lampblack, but this coat must blend with the desired shade, because the finishing color is used thin, so as to avoid any granular appearance. It will succeed in experienced hands.

All these colors must be prepared with turpentine and gold size somewhat glossy. The two coatings may be laid on the same day, with a proper temperature. The first coat may also be given the same day with the pumicing; then the second coloring coat is laid on in the morning of the fourth day, and will be dry in a few hours. As soon as the second coloring coat is dry, it receives a good coating of English varnish No. 2; but, above all, we must first ascertain if the varnish will obtain a good hold, and if it will not, the under paint must be scoured with fine pumice-dust and water.

The day after, or fifth day, we must polish very carefully with fine pumice-stone and a large supply of water. The general mending is made on the sixth day, and the panels are sized with English varnish, diluted with half turpentine and a small quantity of gold size. This coat is spread carefully so as to avoid the swelling of the under parts. The day after, we varnish with a good supply of English varnish No. 2.

The result is that in seven days we obtain a relatively fine painting, which, without having the beauty of first-rate work, will possess a certain style, and, above all, a great durability.

CHAPTER VIII.

PAINTING GEARS FOR EXTRA HURRIED WORK.

WHEN the gears are sand-papered, putty them up, dust, and lay on a first disguise coat of gray lead in which should be mixed a certain proportion of lampblack, which, at the same time, darkens the gray lead, and makes it fit to act as a first coloring coat, and favors the intimate union of the lead with the wood. When this coat is dry, rub it with a piece of stiff linen rag, and putty up the remaining defects with Japan putty. The paint is next laid on with a badger brush, and when dry, but not hard (which we must avoid because the varnish would not hold), we pass over a thin coat of English varnish No. 2 moderately diluted with turpentine. The day after, rub with a rag, pumice-dust, and water, and make the striping with colors ground in oil, otherwise they will crack by the action of the under coats.

We will succeed in obtaining a good result if we do not use too large a supply of varnish; this will enable us immediately to lay a second coat. But this work is very difficult, and requires the joint help of two skilful varnishers, and, if any doubt arises, it is preferable to lay on one coat of varnish only, employed this time plentifully.

This process is certainly not the only one used for hurried work, but it is the best, according to my experience.

I need not state that these observations relate to good work, although they may be applied to that which is inferior.

CHAPTER IX.

ORNAMENTAL STRIPING.

Article 1.

STRIPING consists in ornamenting painted work, and requires precision, a light hand, and a correct eye.

Many of our stripers certainly possess all of these qualities; but frequently they are not allowed to exhibit them, because we require more rapidity than application. However, there are cases where all of the above qualities are needed, as, for instance, when in certain patterns all the lines must be plumb with the panels, equally distant from each other, and equally wide at both ends.

The imitation of cane-work requires skilfulness, and I put in the front rank those who know how to use the mixture for gilding. It is hardly possible to give directions for this kind of work, unless it be for the preparation of the colors.

Article 2.

The majority of painters at the present day prepare their striping colors with turpentine and varnish; these colors are without gloss, do not dry firmly, and often become softened by the glazing coats and varnish. I understand this process for hurried work, but when time is allowed it is preferable to fix the colors with oil; they flow more easily, do not become softened, and will not crack as lean paints so often do.

It is also customary to stripe the gears directly over the painted groundwork, and to cover the whole with varnish polished afterwards. The advantage is that the colors are as if they were buried, and the whole is smoother. But, on the other hand, when the sharp edges have been reduced by polishing, it becomes necessary to paint over the parts rubbed off, which is a loss of time, softens and tempers the color by the subsequent varnish, and granulates the varnish. Therefore, I recommend the execution of the striping after polishing; the shades will be brighter and as smooth, provided the colors are well ground and clean. If we desire to bury the colors well under varnish, we may size them with varnish diluted with turpentine and laid on with a badger brush.

CHAPTER X.

MENDING DENTS, BRUISES, ETC.

THE mending work is very advantageous for young painters, inasmuch as they learn how to prepare the various shades, and train their hands for ornamental striping.

I recommend to the beginner to try his mixtures, first upon a piece of window glass, so as to arrive at the shade desired without injury to the work in case of failure. After this experiment, the color should be laid upon the carriage, and no more color prepared than is required, because what is left may be considered as lost.

I have already spoken of the repairing work (Chapter I., Art. 12), and shall now only mention the process of mending an accident in a panel. These sorts of repairs are very difficult, quite as much so as the concealing of a hole in an old coat with a new patch. However, as this case often happens, here is the process which I have found to succeed the best: Prepare a thick color with turpentine and gold size; but, before the latter liquid is added, it is well to spread the substances upon a thick paper, and to expose them to a gentle heat, in order to evaporate part of the essence.

It is possible with this pasty color to lay a coat every fifteen minutes until the hole or crack is filled. After a day's rest, the place is pumiced.

If the pumicing has changed the shade, this can be remedied by brightening the color with a glazing coat which, when dry, is made fast with Sœhnée varnish. With a very deep hole, it is preferable to fill it up partially with the patent putty, and complete the filling with the color.

But, when we desire to hide completely every trace of repairs, we thin the residue of the paint with gold size and lay a glazing coat over the panel. As soon as all the mending work is finished and dry, we rub and varnish.

It is well understood that this process is intended for first-class work, and that the ordinary repairs are already well known.

CHAPTER XI.

COLORS, HOW PREPARED AND USED.

Article 1.

Yellows.

GENERALLY, all the various shades of yellow are known under the denominations of golden button (*bouton d'or*), mineral yellow, coffee milk, ventre de biche, light orange, &c. All these colors are prepared with linseed oil, turpentine, and a certain proportion of dryer. The desired shade is obtained by the addition of whitelead. One or two primary coats of whitelead are laid upon the pumiced surfaces, before the colors are applied, and must be spread without leaving ridges, and be sufficiently thick. Polish these coats with very fine sand-paper, and give two coatings of color followed by one or two coats of the same color, to which a very fine white varnish has been added. After drying, apply a thin layer of very white varnish (English No. 2). A good result will be obtained if the colors are well prepared and spread with a badger brush. This paint does not require polishing, a rubbing with fine pumice-dust and white woollen rag is sufficient. Wash thoroughly, so that no pumice-dust will remain in the corners. To sum up, these colors need especially great cleanliness in their preparation and use.

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Article 2.

Vermilions.

These substances are very costly, therefore they must be employed economically. The best vermilion is that obtained from England, and is of two shades, light and dark. The latter has no body, and is used only for glazing. The light one, on the other hand, covers a great deal, and is used for groundwork and ornamental striping. Although it is at first more expensive than the French and German vermilions, it costs less in the end, when we consider that it is finer and works easily.

Vermilion possesses natural drying properties, and is ground under the muller with linseed oil thinned with turpentine and a small proportion of dryer or varnish. For striping, it will flow more easily, if it has been mixed with a little flake zinc-white ground in turpentine.

The body coats are made of whitelead mixed with other substances so as to have a flesh color. The first coat of light shade vermilion should contain a small proportion of Italian red, so as to arrive at the shade of dark vermilion. This will enable us to lay one coat only of glazing, otherwise two would be necessary. The varnish laid over the vermilion color must be white the same as for the yellow.

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Article 3.

Lakes.

The lakes are of various shades and qualities. The best are those known under the name of carmine and English lakes, and are employed only for superfine work. That most in use is carmine lake, and the others are lakes from tinctorial woods, the use of which I do not recommend.

There are two shades of carmine lake, pink and dark; one goes with dark grounds, the other with light ones. If neither of them will answer for the shade, they may be mixed together. The glazing or transparent coats prepared therefrom have no body, and, in order to give them some durability and facilitate their use, they must be ground very fine and prepared with oil and a little dryer.

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Article 4.

Ivory-Black.

Ivory-black is one of the colors most employed for coach painting, and many qualities of it are to be found. As all bear the same name of ivory-black, the difficulty lays in the choice. I recommend the choice of that in blocks, light in the hand and with a fracture of a smooth grain without bright points.

This black must be very carefully ground with essence of turpentine, to which English Japan varnish is added. This liquid is certainly the best for this color, to which it imparts body; it also aids its drying, and gives a fine shade. Ivory-black thus prepared is perfectly adapted for striping; but for groundwork it must have a half gloss only, and then it will cover beautifully an undercoat of lampblack. However, if we desire a very fine black we must lay another glazing of Japan mixed with black. This glazing must be sand-papered or pumiced before varnishing.

Article 5.

Blues.

The blues employed in our art are mineral, Prussian blue, Flora blue, and lapis lazuli; but the last is so expensive that we merely mention it; it is substituted by artificial ultramarine. The best is that of Guimet, although it has no body, and is employed only for transparent coats (glazing).

Prussian blue has a copperish tinge, and does not give pure shades. Moreover, there is something in its nature which acts upon the substances with which it is mixed. Its only advantage is that it possesses more body than the other blues.

Mineral blue is the most reliable; however, Flora blue has a finer shade, but does not cover as well.

The quality of these blues is ascertained by mixing them with whitelead; if the blue is inferior, the shade will be grayish, instead of pure blue.

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Article 6.

Fine Green (*Vert Fin*).

The invention of this green is of great service to the painter, because, previous to its discovery, it was necessary to compound it, and then the blue would act upon the other substances, and the green become decomposed after standing in the air.

Up to the present time the English greens have been incontestably superior. However, the dark green, called emerald green, does not possess the proper shade for mixing with ivory-black, and the result is a false tint. The French green, on the other hand, gives a rich shade. The qualities to be considered in this green are, therefore, its shade and its fineness.

There are such a number of shades of green that many are useless. I think that the three following shades are sufficient: dead leaf, grass green (*vert pré*), and dark emerald. With these three shades and ivory-black we may obtain all, or very nearly all, the desired tones.

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Article 7.

Van Dyck Brown.

Van Dyck brown is one of the hardest substances to grind, and we should be thankful to those who sell it already ground; it is stirred and beaten like lampblack. This brown is very drying, and may be prepared with equal parts of oil and dryer, the same as the fine greens; but, when it is compounded with ivory-black, it must be prepared with varnish and a dryer. However, if this brown is to be employed without any admixture, it is preferable to buy that which is not powdered, and then to grind it very fine.

The latter has a watery reflection not to be found in the former, which, however, is excellent for mixing.

Van Dyck brown is very serviceable for making fancy shades; moreover, it has great durability and much body.

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Article 8.

Umber.

There are two kinds of umber—raw and burnt. Raw umber is so dull in shade that it is scarcely used. Burnt umber, on the other hand, possesses a very rich shade, with which fine tints may be obtained by an admixture of Japan, chrome red, &c. This earth is very hard to grind, and may be substituted by a compound of Van Dyck brown, ivory-black, and a small quantity of yellow red and Japan. This mixture is inferior in durability to the natural earth, and is prepared with varnish and dryer, while the pure umber is ground in oil, as it possesses great drying power.

Article 9.

Whitelead.

Whitelead is superior to all other whites. This substance is often adulterated, and we may gain some knowledge as to its state of purity by the following process: Crush a small quantity of whitelead upon coarse paper which is folded, and then light it, keeping it on top of a plate; if yellowish and flat particles fall down, it is of inferior quality. Good whitelead will produce bright grains of metallic lead.

However, the best way of obtaining a pure article, well ground, is to buy it already ground in kegs bearing the mark of some honest manufacturer, such as Theodore Lefebvre & Folmann.*

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Article 10.

Ochres.

These comprise red and yellow ochres; the latter is most employed, especially for filling coats.

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* J. T. Lewis & Bros. and Harrison Bros. & Co., both of Philadelphia, are well-known American manufacturers of superior qualities of whitelead.—*Trans.*

Before it was sold in the powdered state it was necessary for the painter to grind it, which was a loss of time and an imperfect work, because there were always left some gritty substances which the pumicing could not eliminate. The dry powdered ochre needs only to be stirred with oil. But as the grinding is effected with the aid of water, it must be dried perfectly before use.

Article 11.

Precautions to be taken with Colors.

Whatever is the nature of the colors, in lump or powdered, they must be employed perfectly dry. Their state of dryness is seen by breaking a lump, the fracture of which must be firm, smooth, and of very fine grain. It is also essential to keep all the coloring substances in a dry place. Damp colors prevent the drying of the coats, and impair the fineness of the shades. All the liquids for the preparation of colors and varnishes must also be free from dampness.

CHAPTER XII.

LIQUIDS, THEIR USE AND QUALITY.

Article 1.

Varnish No. 1.

The beauty and durability of paints depend a good deal on the use of this varnish, which must be of good quality; but as this can be ascertained only when applied, it becomes important to buy it from respectable houses. There are several numbers with varying prices; but all must be manufactured with hard gums and superior linseed oil; their difference lies in more or less whiteness and body.

No. 1 is for finishing work, No. 2 for polishing or rubbing varnish, and No. 3 for tempering and diluting dark tints, or for mixing with No. 2 and light colors.

Although the manufacture of these varnishes has made great improvement in France, the English finishing varnishes keep their superiority notwithstanding that they do not last so well as those of our own fabrication.

French varnish is open to the inconvenience of softening the under coats, which impairs the ground work; English varnish,* on the contrary, does not have such an effect, and flows more easily. These varnishes will mix with ordinary turpentine, but it is prudent to have at hand some New York essence of turpentine, which, in case of accident, may be used for scouring a panel.

Finishing varnish must be laid on freely and must be well pressed upon the surfaces, thus imparting a gloss to the paints. The operator who knows how to spread this varnish freely and without producing runs, is certainly a skilful worker.

Varnish No. 2.

It is often difficult to succeed with this varnish; some find it too fat, others too lean and hard to spread. There is, however, a very easy way of suiting it to our wants when it is too lean: add a very small proportion of linseed oil; too much would make it crawl or gather up.

It is scarcely possible to mend the excess of fatness, which renders its polishing difficult, and may be in the way of a successful painting.

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* This varnish of superior quality is now made in this country by Valentine & Co., Cambridgeport, Mass.—*Trans.*

Varnish No. 3. Varnish for Repairs and Sœhnée Varnish.

Varnish No. 3 is seldom used except for preparing colors. The varnish for repairs is for hurried mending work, but the less employed, the better, on account of its bad quality.

Sœhnée varnish* possesses the advantage of drying instantaneously when it has been laid over half dry repairs, and does not soften the paint or modify its shade. There is no difficulty in laying a coat of fat varnish over it, ten minutes after it has been applied. It is very useful for fixing or setting (making fast) the corners of bodies at the last varnishing.

This varnish must not be kept exposed to the air, and a cold temperature causes it to cloud over. If this accident happens, its nature may be restored by holding a lighted candle near the whitened parts. It is kept closed in small bottles holding about one-tenth of a litre (three to four ounce bottles). A small pencil is adapted to the cork, so that the hair dips into the liquid.

Note.—The varnishes of Valentine & Co., 88 Chambers Street, New York, Factory at Cambridgeport, Mass , are recommended by many practical men as fully equal to the best imported.—*Trans.*

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* From the name of the manufacturers, Sœhnée frères, of Paris.

Article 2.

Dryers.

Dryers, like varnishes, must be bought of good manufacturers. However, we may easily ascertain if the dryer has a tendency to become cracked, by spreading a portion of it upon a pane of glass, which is left exposed to the direct action of the sun. When it has entirely lost its fluidity, scratch it lightly with the nail, and if it falls in powder without cracks, its quality is satisfactory. A similar trial, not so reliable, however, may be made with the japans and the varnishes. We must not confound a crack with chilliness, because every similar liquid, when cold, presents the latter defect, which is not very objectionable. The cracks which we must avoid are those produced by new liquids in their bright state. The liquid which begins to enamel at various places is of inferior quality.

The dryers for our art are made of oil purified and boiled with drying materials, which must not be injurious either to the paints or to the varnishes. Boiled linseed oil (without any drying materials) has been found injurious to paints, and is scarcely used now-a-days. Therefore with a good dryer we may prepare all the colors of a dark shade, excepting those with ivory-black, when a little varnish must be added, and the coats must be without much gloss, otherwise they will not hold the subsequent coats.

Gold Size.

This kind of dryer comes from England.* It is superior to ours in certain respects, dries more quickly, but is very costly, and tacky, which necessitates prolonged rubbings. This size mixed with English varnish, a small quantity of japan, whitelead, and chrome yellow, makes an excellent mixture for gilding. This dryer is very useful for hurried work, and is the only one which blends perfectly with English varnish.

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Article 3.

Linseed Oil.

Of all oils employed in painting, linseed oil is certainly the only one which should be used by coach painters. It is superior to all others by its drying properties, but must be free from all adulteration. At the present day it is falsified with oils from gas-houses, which are easily ascertained by their bad smell.

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* Made by Valentine & Co., Cambridgeport, Mass.—*Trans.*

With good linseed oil we may prepare all those colors which possess drying properties in themselves, but mixed with a variable proportion of a dryer. Paints, thus prepared, flow more easily and have more body than those made with varnish. But we must avoid using linseed oil with non-siccative (non-drying) substances, such as the blacks. These must always be employed in connection with a dryer and varnish.

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Article 4.

Turpentine.

Essence of turpentine is the only essential oil in use in coach painting. Its smell is an indication of its quality; when adulterated with tar oils, the smell is very bad indeed. The purest has been rectified, and comes to us, *via* England, with the name of New York turpentine. Its high price is an obstacle to a more extended demand; however, I suggest that coach painters should have a certain quantity of it always on hand. It is necessary for thinning old English varnish, and for removing coats of varnish unsuccessfully laid on.

Article 5.

Mixture for Gilding, and How to Use it.

A few years ago, the processes for preparing carriages for gilding were so expensive, that only the most wealthy could afford it. But now, the process is the same as for ornamental striping, with the only difference that the under coats must be entirely hard, and the work done in a perfect manner.

In the article relating to gold size, I have mentioned that this substance may be used as a laying coat. However, the mixture of the house gilders is preferable, and consists of an addition of white-lead and chrome yellow ground very fine with linseed oil.

This mixture must be used quite dry, that is to say, often stirred, and the brush or pencil pressed against the sides of the cup to remove all excess. A good mixture may receive the gold twelve hours after it has been laid down, and the same process answers for bronzing. When the gilder has delivered his work to the painter, the latter must wash it with plenty of water, taking care not to scratch the gold. It is better to wait three or four days before washing.

The gold striping receives a first fixing with gelatine dissolved in water, and a second with white varnish diluted with turpentine. When all is dry, the portions of gold which may have stuck against the paint of the groundwork are covered with the same color, or, if we desire to avoid this extra work, we rub the body and gears with a sponge dipped into water containing finely levigated clay.

CHAPTER XIII.

CANEWORK.

THIS kind of fancy striping was much used in Paris some thirty years ago, and lasted about three years. Now, since it has been introduced in relievo from England, fashion has taken hold of it again, and it is in much demand.

Canework executed with the pencil is quite difficult, and requires a skilful ornamental striper. The main condition is the dividing of squares well plumb with the panels, and the delineation of a perfect octagon in each square. For a satisfactory cane striping, the work cannot be completed at once; it is necessary to lay at least two coats of paint, and very few stripers will be entirely successful.

Cane striping in relievo by means of a tube is preferable to the former method, because it shows off better. It is not necessary to be a first-class striper for this kind of work; any intelligent man who knows how to use a drawing pen will succeed after a little practice.

The color for cane striping with the pencil is composed of whitelead, yellow ochre, and a small quantity of vermilion, the whole ground in pure linseed oil thinned with turpentine. During the winter a certain proportion of dryer is added. The color for canework in relievo is composed of the same coloring substances ground in turpentine and mixed with drying oil. The requisites are fineness and cleanliness for the paint and the tube.

CHAPTER XIV.

ACCIDENTS IN GENERAL.

Article 1.

Crawling, Gathering Up.

A VARNISH has crawled when, after being spread, its surface presents portions which have contracted. This is sometimes due to the inferior quality of the varnish, but most generally to coolness in the temperature. In winter this accident happens where there are unequal thicknesses of varnish.

Therefore, we must avoid: too thin coats in cold weather; the exposure to the air of a body before the varnish has had time to become somewhat hard; the direct action of the sun.

A slight crawling may be remedied by an increase of heat, in the drying-room, for instance. But when the defect has disappeared, we must avoid any chilling by cold, because there would be no further remedy. Therefore, the proper temperature must be kept up until the varnish is hard. It is then polished, and after further hardening, it must receive a fixing coat, be rubbed and varnished for the last time.

If it is not possible to remedy the crawling by the above process, the defective parts must be removed with a knife, washed with a rag without lint, and varnished again with a small brush. When these parts are dry, they are smoothed with a pumice-stone, and rubbed with a rag and pumice-dust before striping.

In the case of a general crawling, there is no other remedy but to wash off all the varnish with turpentine and a linen rag, provided the varnish has not hardened too much. Then, allow the panels to dry, and polish.

But when the varnish has set so that it cannot be dissolved, let it dry, then scrape it, pumice, and paint again.

Of all the accidents which may happen to the coach painter, crawling is the most troublesome.

Article 2.

Blisters.

Too much heat, artificial or natural, may produce blisters. One rationale is, that when the upper coats are laid upon under coats too lean or too hard, there is no adhesion between them, and the heat raises the upper ones.

The other cause is due to varnishes which have been exposed to a too high temperature before they had time to become hard enough. The sun, during the months of March or April, at our latitudes, is especially to be avoided. Blisters are removed, and filled up in the manner indicated in the article on repairs.

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Article 3.

Cracks.

When a paint cracks before it has become old, it is due to the use of inferior substances, or to the incompetency of the painter.

The best manner of protecting the work against cracks, is the use of good liquids applied by a reasoning man. The first priming coat must be rich in oil, while the other coats are prepared with a half gloss only until we lay the last coat of color. Then finish with fat varnishes, and you will obtain a paint which will last a long time without cracking.

Article 4.

Swelling of Leather.

This is a difficult question. Notwithstanding numerous observations and personal protracted study, I am still unable to give a decided opinion on the subject.

However, I am inclined to believe that the cause of these swellings is due to the previous priming of the wood upon which the leather is glued. A comparative experiment may be made upon two boards of a panel, one of which has received a priming coat.

Article 5.

Pits in Varnish.

We say that there is pitting when the coat of varnish becomes perforated by thousands of small holes. Pits may proceed from three apparent causes: Introduction into the varnish of too large a proportion of drying material, which accelerates the drying and produces the pits; a fatty substance on the coat underneath; thus, new coats of paint which have not had sufficient time for hardening thoroughly, remain with glossy points after polishing, and it is just at these places that the varnish pits; the introduction into the finishing varnish of some liquid which does not combine with it. Therefore, when laying the finishing varnish, we must be very particular to employ clean pots and brushes, and a well-known varnish.

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Article 6.

Scaling off of the Paint, and its Causes.

Such accidents happen very often, and quite as often is the fault laid at the door of the painter, right or wrong. We must observe that the paint scales off particularly from the felloes and the hub; the cause is perhaps due to the habit of dipping the hubs in water, in order to prevent the wood from breaking; on the other hand, when the tires are put around the wheels, the water thrown upon them is not completely evaporated when the paint is applied. It results in both cases that the paint cannot penetrate the wood, and scales off when dry.

The same result will be produced by green wood, or by the first coat of paint, after pumicing, being too poor in oil.

Article 7.

Stains on Varnished Paints.

What amount of trouble and blame is heaped upon the painter by the owner of the carriage upon which such accidents appear? The coach maker, then attributes them to causes which are not real.

I know that I am correct when I say that the better the varnish, the more easy is it to become stained, because on account of its great lustre, and its fatty nature, the smallest foreign substance which touches it is sufficient to produce a stain. An inferior varnish is not so easily affected. The most troublesome stains are those caused by the Paris mud, which is easily understood when we consider that it is the admixture of all the decomposed dirt of a great city. The varnish is burnt and the stain cannot be entirely removed.

In order to remedy such an accident, as far as possible, we must, when the varnish is hard enough, polish with water and tripoli, very finely ground, or with a great deal of water and rotten-stone. Afterwards, the panels must be rubbed with a fine rag dipped in sweet oil, and if the rag is not sufficient, the rubbing should be made with the hand. This operation by which a lustre is given is completed by a dry rubbing with a clean rag.

The best manner of preventing the stains from becoming inlaid, consists in leaving the varnish to dry completely, and in never allowing the mud to stay a long time on it. When the carriage has been washed several times, ten for instance, it is advisable to rub it with sweet oil as before mentioned.

A varnish is said to have clouded, when, a few days after it has been laid on, it has lost its gloss. This accident seldom happens except in damp weather; a varnish freshly spread and exposed to damp air becomes covered by a mist which leaves its mark upon it. This effect, however, may be remedied by an exposure to the sun.

There is another kind of clouding due to the dampness of the ground in storerooms and coach-houses, and which penetrates the varnish completely, and often decomposes it. The only remedy is another varnishing, and I must again repeat that the finer the varnish, the more easily clouded it is.

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Article 8.

Leather Panels.

The painting of leather is certainly very troublesome, because it may become unglued, crimpled, &c., the fault of which is always attributed to the painter.

When a swelling appears upon a panel, it is evident that the leather has become separated from the wood, and this defect appears only when the paint has been varnished. This accident therefore arises from the infiltrated water used for pumicing and polishing, the leather becomes dampened and the glue softened, hence the swelling.

Crimples are due to the same cause; water has penetrated the leather without reaching the glueing paste, and we must notice that these crimples are to be found almost always at the base of the panels, and above the lunette (dormer window), which is a proof that the water has penetrated the edges of the leather.

Cracks will also take place on the roof, and on the barrelled seats of ceremonial carriages. The reason is that the boards of the roof become disjoined by heat after the laying on of the leather, and cause it to bend. When dampness occurs, the boards become tight, the leather swells, and the paint which has become hard scales off.

The cracks on the barrelled seats are not due to the same cause; I have often seen an empty space between the wood and the leather. Add to this the rolling and the shocks of the carriage in motion, and we can understand why the leather becomes stretched and breaks.

There are also those small cavities which appear at regular distances after the spreading of the last coats of paint. These small holes are occasioned by the stretching action of the small tacks employed on the wooden panels, when they have been too much punched in.

But if, instead of these cavities, there appear small swellings, the cause is due to the tacks which have not been sufficiently driven in, and which by the motion of the carriage have a tendency to come out, and push the leather back.

Now that I have mentioned all the difficulties which may attend the painting ot leather, I shall try to give some advice, based upon a long study and experience, for avoiding or remedying these accidents.

Article 9.

Loosening of the Leathers.

It is customary to give a priming coat to the wooden panels which are to be covered with leather, and I have myself followed this old custom, although I have often protested against it. It is evident that the watery paste employed for glueing leather is incompatible with fatty substances, and this is so true that if we glue leather upon two boards, one of which has been painted and the other not, the leather will be found more adhesive and firmer on the unpainted board.

The small swellings, cavities, &c., must be avoided by driving the tacks into the wood not deeper than one millimetre (about $\frac{1}{27}$ of one inch), and afterwards passing a wet sponge over them. The wood swells and covers the heads of the tacks. When the wood has become dry again, lay on the leather, previously stretched.

When the leather is sufficiently dry, it is nailed very carefully, taking especial care that no air penetrates between the leather and the panels, because the air will, by dilatation, cause swellings. Unless very dry, the leathers do not receive a priming coat, and, to be doubly sure, we should pass a hot sad-iron over their surface, with the interposition of a sheet of paper between the iron and the leather, so as not to burn the latter. When no trace of dampness is left, we may lay on the priming coat. This process has also the advantage of stretching the leather, and rendering it tougher.

I especially recommend a careful puttying with the oil putty of the mouldings of the lunettes (dormer windows) and those of the lower parts of the Custoldc panels, before pumicing.

Leathers thus prepared can scarcely become loose.

The small roughnesses which may appear after the pumicing of the body, must be levelled with a sad-iron, and then rendered smooth by another pumicing with turpentine. Should the preparing coats be too thin, we must give two coats of gray lead before the last pumicing. But, when defects appear after varnishing, we must pumice with water, and then give a glazing coat with Japan varnish.

The moulding strips, when they are to be painted black, are put in their place only after the dressing of the body, and by all means the infiltration of water into the tack-holes must be avoided. The workmen should use slender awls for marking the place for the tacks, and must not make a deep hole, because it would become necessary to remove the tool violently, the leather would be raised, and water could penetrate underneath.

For the barrelled seats when the leathers are fractured, I do not know any other process but removing the old paint, and painting afresh. I think that a good preservative would be the stretching of a piece of canvas before the leather is laid on, and making a flexible paint by a good supply of fatty oil.

The cracks on the roofs should be filled with rough stuff kept fat.

It remains for us to consider the painting afresh of old leathers. When the paint is thoroughly cracked, there is no other way but burning it. A great amount of care is needed not to burn or raise the leather; a burning cannot be repaired, but raised leather may be levelled down. As soon as the leather raises, the raised parts must be immediately wetted so as to soften the leather which is, afterwards, pressed in place by a hot iron.

I shall end this long article by stating that my advice on this ungrateful and difficult subject may be modified according to circumstances, but that it is based on careful study. Perfection in this kind of work is difficult.

CHAPTER XV.

MISCELLANEOUS.

Article 1.

Iron Panels.

Paint laid over metals and leather possesses much more durability than that on wood. However, sheet iron is open to the objection of rust, which granulates the paint, and is very difficult to avoid. We may obviate these defects by a proper mode of working.

When the plates of sheet iron are put in place, all flaws must be removed, and the surface of the metal should receive a coat of linseed oil wiped off with a rag. The priming coat is composed of white and red lead in oil, and when dry, all the hollow parts, tack holes, &c., must be puttied up before the mouldings are put in place.

The remainder of the painting is done as for wooden panels; but I will observe that every part of wood in contact with the iron must receive a thick coat of fat oil paint.

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Article 2.

Brushes, Tools, and Pencils.

The coach painter uses round and flat brushes, made of various kinds of hair or bristles. Two brushes are necessary for levelling the colors and the transparents coats, one for spreading, and the other for smoothing or blending.

There are many kinds of small brushes, tools, and pencils, and each has its duty to perform. Badger pencils are very useful for painting the mouldings and irons of bodies, but they are still more useful for painting the gears. They require the employment of fluid paints, which is an economy. A badger pencil neither produces ridges, nor encroaches (in a steady hand) on reserved parts, which it is difficult to avoid with a flat brush.

There are also short pencils, and pointed ones with two and three quills, pencils for mouldings, bands, fillets, striping, &c.

The round brushes made of grayish bristles, are employed for laying on the priming and filling coats. Flat brushes are used for spreading the colors and varnishes.

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Article 3.

Compounding various Fancy Shades.

Yellows.

Although the yellows may be bought ready made, there are nevertheless many shades which we are obliged to prepare ourselves.

Straw Yellow.

This is composed of light chrome yellow, called Canary yellow, and mixed with whitelead to suit the shade.

Citron or Lemon Yellow.

This is made of golden button (*bouton d'or*) yellow with a trace of blue, and if a very light shade is desired, whitelead is added.

Coffee and Milk Yellow.

Whitelead mixed with yellow ochre, and a small proportion of asphaltum.

Fire Yellow.

Composed of light chrome yellow and sienna.

Nankin Yellow.

A mixture of whitelead and yellow ochre, to which is added a small quantity of sienna or pink lake.

Chamois Yellow.

Made of whitelead, yellow ochre, and a little vermilion.

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Article 4.

White.

Whitelead requires a very slight addition of blue or ivory-black in order to present a fine shade, and also to sustain the varnish.

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Article 5.

Greens.

As with the yellows, the trade does not supply all the shades of green.

Imperial Green.

A compound of emerald green and ivory-black.

Dead Leaf Green.

Although this green already possesses a rich tint as it comes from the laboratories, it may still be mixed with white, yellow, or red, according to the desired shade.

Bottle Green.

This peculiar tint is obtained with lampblack only, and the true shade is reached by varying the number of coats of varnish.

Water or Sea-Green.

A compound of whitelead with very light *metis* (mixed) green.

In regard to greens, we may sum up as follows: The chemical greens may be mixed with black for dark shades, and with yellow for light ones. It is also well-known that a mixture of blue and yellow produces a green color; therefore, the shades will vary with the quantity and the peculiar tinge of the yellow employed.

Article 6.

Browns.

In general, browns are composed of red and ivory-black; lampblack does not produce a true shade. There is also Van Dyck brown, which is a natural earth with a rich shade, and which may be darkened with black, or English Japan. In the latter case the shade is very bright.

Spanish Tobacco Brown

Is obtained by mixing Van Dyck brown, with ivory-black, yellow-red, or vermilion.

Carmelite Brown.

A mixture of Van Dyck brown with lampblack. The varnish laid over raises and brightens its shade considerably.

Umber Brown, Burnt and Raw.

These two coloring substances naturally possess a rich shade, and a quantity of new tones may be obtained by their own admixture or with other substances.

Article 7.

Raven-Wing Black.

This shade may be obtained with ivory-black and Prussian blue, to which we may add a very small quantity of burnt umber.

Negro Head Black.

Made of ivory-black, fine dark green, and a slight addition of vermilion.

London Smoke-Black.

Composed of ivory-black, some orange yellow, and a very small proportion of raw umber. It requires a little Japan.

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Article 8.

Various Colors.

Violet.

A mixture of blue, lake, and whitelead.

Pink.

A fine pink results from the admixture of white-lead with carmine-lake.

Lilac.

A compound of whitelead, lake, and blue.

Here ends this rapid examination of the composition of shades. I have mentioned only those shades which are most required by the coach painter. A full treatise on the subject would require a separate volume.*

Article 9.

Fancy Groundworks.

Gold Ground.

Gilt panels require a well-polished white ground, composed of several coats of whitelead. Shellac varnish is laid over, and polished again when dry. Afterwards, the already mentioned gilding mixture is spread, and receives gold, silver, platinum, or bronze; then two coats of varnish No. 2, a polishing, and the finishing varnish.

Tortoise Ground.

Upon a silvered ground lay a lacker, and marble with asphaltum ground with drying oil and a good supply of varnish. Another method is a groundwork of Indian yellow marbled with burnt sienna.

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* See the Painter, Gilder, and Varnishing Companion. 16th edition. Philadelphia: H. C. Baird, Publisher.

Avanturine Ground.

When blue, green, or brown groundworks have received their first coats of varnish, dash upon them, by striking the brush on the left arm, as house painters do, a mixture of gold, silver, or bronze powder in linseed oil. With a little practice the surface is sanded with sufficient accuracy. Several coats of varnish are laid over, and the whole is finished by polishing and spreading the finishing varnish.

Spangled Grounds.

This kind of ornamenting is still in fashion in Egypt, and consists of spangles of platinum fixed upon the gold size mixture and painted with transparent coats with fancy ornaments.

Ruled Grounds.

These are a sort of striping work made by processes similar to those for canework.

Imitation of Balusters.

When the panels are nearly painted, the balusters are drawn. If their color is the same as that of the groundwork, they are called balusters Camayeu fashion. But balusters are also made of various colors, and when dry, they receive several coats of varnish, are polished and varnished for the last time.

Grounds with Natural Cane.

The grounds are of various shades and are entirely finished, because, once the cane is put on, nothing more is done, not even the varnishing of the cane, which possesses a natural varnish; but when the cane is old, it is polished and varnished.

Ground with Inverted Hexagons.

The lines are drawn with chalk upon the panels, and then the painting, polishing, and varnishing are proceeded with as explained in the preceding articles.

Imitation of Blinds.

These blinds necessitate two colors, one dark, the other light, and the foils are shaded with a small brush or pencil.

Mat-work, tessellated panels, &c., are other samples of fancy ornaments for bodies.

Article 10.

Process for making a Sample of an Ornament for Coach Painting.

Cut a piece of thin paper to correspond to the size of the glass plate upon which the sample is to be represented, and draw with pen and ink or with a lead pencil the desired ornament. The drawing is then laid against the glass, upon the opposite side of which the lines are reproduced with a fine pencil and lampblack. The paper may be kept for another trial. On the side of the glass plate, opposite to that where the lampblack lines are painted, we lay the different coats of color, beginning with the last ones, that is to say, the last coats on the carriage are the first on the glass, and conversely. Such samples have been made with more than a hundred different shades.

A skilful painter may begin by varnishing the glass, and we have then a true representation of the desired work.

CONCLUDING NOTE BY THE AUTHOR.

The author does not ignore the fact that improvements, sometimes superior to the old processes, are constantly being made. He has simply described the methods and processes which he has found to succeed the best in his practice of many years. Before taking leave of his brothers of the craft, he wishes them that which it has been his good fortune to have, a long life with constant, well appreciated, and remunerative work, which should allow every intelligent industrious and honest worker to retire from business with an independent competency. To which all employers will say—Amen.

APPENDIX.

Except where otherwise indicated, the articles in this appendix are selected by permission from The Hub, a monthly journal for the carriage and car shop, edited by Geo. W. W. Houghton, Esq., and published by Messrs. Valentine & Co., 88 Chambers Street, New York.

Coach and Car Painting in London.

Editor of The Hub: I have been much interested in the perusal of your valuable monthly, and thinking it may be of interest to some of your other readers, I give you a brief synopsis of the system of painting as practised in London by two of the leading coach builders, who are manufacturers to Her Royal Highness. I visited their factories in November. As your correspondence from a Boston painter, which described the method of painting in that city, contained many points of interest to the London painter, so in return I think the variations therefrom, which are here noticed, will be worthy the attention of your Boston painters. The rapidity with which you paint a job in America is very surprising to the London painters. In London, a very tedious and expensive process is employed, but great durability is thereby obtained. I don't think either party is wholly in the right. We use too much time, and you perhaps too little, but by a proper attention to both speed and durability, or a proper mean between the London and American methods, I believe that a method preferable to either may be worked out.

The London builder proceeds thus in painting the body of a fine coach:—

4 coats of lead.
7 “ “ rough-stuff.
1 “ “ lead.
putty and face.
1 coat of lead, and sand-paper.
1 coat of lead, and sand-paper.

14 coats before coloring.

From this point, the upper and lower panels of the body are finished differently, namely:—

Lower panels.

3 coats of color.
1 “ glazing.
4 “ hard-drying varnish.
1 “ wearing body.

9 coats, or 23 from the beginning.

Upper parts.

1 coat ivory-black.
2 “ black Japan.
2 “ hard-drying varnish.
1 “ wearing body.

6 coats, or 20 from the first.

The flatting is left to the judgment of the painter, and is arranged according to the finish required to suit the perchaser. Sometimes every coat is flatted, and sometimes only every other coat. To obtain perfect smoothness a great deal of time is used in rubbing. Another process that is employed for jobs that are less nice is as following:—

2 coats lead (priming).
5 " rough-stuff, and rub.
1 " lead (facing) and rub.
1 coat ivory-black.
2 " black Japan.
rub one or both, at discretion.
1 coat flatting varnish.
1 " wearing body.
—
13 coats in all.

When the body is not to be black, two or three coats of the required color take the place of the two coats of black Japan, and an additional coat of flatting varnish is used. All the color coats and rough-stuffs are mixed with Japan gold size.

In the large railway shops, which I visited about the same time that I visited the coach factories mentioned above, I found that more attention was paid by them to durability and preservation of the paint than to the perfect smoothness of the job. The last color coat is generally mixed with part varnish, over which one coat of hard-drying varnish is flatted. and the job is finished with three or four coats of best wearing body. The latter is applied, a coat every other day, and sometimes a coat every day. To do this each coat has to be flatted with superfine pumice and cold water, just enough to allow the following coat to lay.

LONDON, *March*, 1870.

Coach Painting in Leeds, England.

The following letter comes from a practical coach painter of Leeds, England, who has had an experience of over thirty years; and he is therefore well calculated to talk with the painters in detail upon every point connected with painting as practised in that city. It contains facts which will be of interest to every practical painter:—

THE BODY.—In the first place, Mr. Editor, it will be necessary for me to explain to your readers that the English coach differs somewhat from the American coach when it comes from the wood-room into the paint-shop. *All the panels of the body are of mahogany*, which I do not think is often employed in the United States for this purpose. Moreover, the roof and quarters of the coach are covered with a *raw hide of leather*, which is nicely stretched and rubbed down, and presents a fine and even surface. The leather-coated parts are first primed with two thin coats of black Japan (corresponding to the black body varnish used in America), reduced with a little turpentine. The remaining portions of the body are primed with light lead color, mixed with a little raw oil and turpentine, and a small quantity of sugar of lead to help its drying. This drier is necessary from the fact that *in England the paint-shops are kept much cooler than in America*, and the atmosphere is moister and less calculated to assist the drying process.

The body receives, in the next place, two thin coats of color, and the nail holes, etc., are stopped up with hard-stopper, made of dry lead mixed with Japan gold size. Five coats of English filling-up are next added, being mixed as follows:—

2 parts of English filling-up.
1 " " tub lead.
2 " " turpentine.
1 " " Japan gold size.
½ " " bottoms of wearing varnish.

These five coats of rough-stuff must be laid in, in the same manner as heavy coats of varnish, one coat per day; and three additional coats of the same are generally added to the parts covered with leather. Throughout all this process, great care is used to keep water from the leather, to which it is very injurious; and this is one reason why it is covered with so many coats of rough-stuff. The receipt which I have given is a standard one, and is guaranteed to rub well, and to a smooth surface. A staining coat follows, and the body is then well rubbed down, and cleaned off. Two coats of dark lead color are next given, being mixed of tub lead, lampblack, raw oil, and a small quantity of sugar of lead, and reduced to the proper consistency with Japan gold size and turpentine, and applied one coat per day, and sand-papered after each coat. This dark surface gives the painter a chance to see any scratch or imperfection that may be left in the surface, and which requires stopping up. When this is attended to, the body is carefully faced down, which produces a very fine and even surface. Another coat of dark lead color, same as those last spoken of, is then applied, and the body is ready for color. Below we give a synopsis of the foregoing, that the painter may have a concise view of the entire process:—

Preparation of Body for Color.

1 priming coat of lead (on leather parts 2 coats of black varnish instead).
2 thin coats of color.
Stoppered up.
5 coats English filling up (8 coats on leather parts), 1 staining coat.
Rubbed down and cleaned off.
2 coats dark lead.
Stoppered up.
Rubbed down carefully.
1 coat dark lead.
—
12 coats, and ready for color.

Gears.

Two priming coats are first applied, being mixed the same as that used in priming the body. The cavities are then stopped with hard stopper, to which a little turpentine is added, in order to make it sand-paper easily. The wood parts then receive two coats of quick drying lead color, mixed of dry lead and lampblack ground in Japan gold size, and thinned with turpentine. The whole is then sand-papered down thoroughly, and the grain will be found to be well filled and perfectly smooth. A thin coat of oil lead color is then added, and well sand-papered, and any joints or open parts between the tire and felloe are carefully puttied up with oil putty. The carriage parts are then ready for color. Below is a synopsis:—

Preparation of Gears for Color.

2 coats lead priming.
Stoppered up.
2 coats of lead.
Sand-papered thoroughly.
1 thin coat of lead color.
Sand-papered, and puttied up.

5 coats, and ready for color.

Yours truly, W. H.

LEEDS, YORKSHIRE, England.

The following letter is continued from one in the October Hub, which described the preparation of the body and carriage-parts for color. It is written by a practical coach-painter of Leeds, England, who has had an experience of over thirty years, and he is therefore well calculated to talk with the painters in detail upon every point connected with painting as practised in that city. This letter continues the description from the completion of the surfacing process to the finishing coats of varnish, and it contains facts which will be of interest to every practical painter.

Finishing the body.

In my last letter, Mr. Editor, I made a coach body ready for the painting, which I will now continue.

If the body is to be black, we proceed as follows: Grind drop black in raw oil, stiff, and add a little sugar of lead, very fine, for a drier, and thin to the required consistency with black Japan (black body varnish) and turpentine. Apply two coats of this, and then give two coats of black Japan (black varnish), and rub it down. Then face off the mouldings, and give a thin coat of dead black, and then apply a second coat of black Japan, and flat again. The whole is then varnished with hard-drying varnish, and after the fine striping and coat of arms are painted, the whole is finished with wearing body varnish.

If the body is to be blue, mix ultramarine blue with one half raw oil and turpentine, stiff, and make of the proper working quality by thinning with hard-drying body varnish. Two coats are applied, and after each coat a slight flatting is necessary, and then two additional coats of the same are applied with varnish added. When Prussian blue is used, two coats are applied, and white is added if necessary for the purpose of producing the shade required. The blues will dry sufficiently well when merely ground in raw oil, stiff, and reduced with turpentine, and it is better not to add any drier. Over blues only one coat of hard-drying Varnish is given, and one finishing coat.

If the body is to be lake, the lake should be ground in raw oil, stiff, and reduced with turpentine and hard-drying varnish. The same with drop black and Indian red. Over lakes and greens, two coats of hard-drying varnish are applied, and one coat of finishing.

The painter must in no case allow his oil colors to dry with a gloss, but he must always flat them, and give them the appearance of dead color. This is particularly important in case rough-stuff or quick-drying color is to be used over it.

Below we give a synopsis of the painting and varnishing of a black body :—

2 coats drop black.
1 coat black varnish,
rubbed down and mouldings faced-off.
1 thin coat of dead black.
1 coat black varnish,
rubbed down.
1 coat hard-drying varnish,
striped and ornamented.
1 coat wearing body varnish.
—
7 coats from the beginning of color.
12 " in preparation for color.
—
19 coats in all, upon bodies.

Finishing the carriage parts.

Two coats of lead color are first given, made the same as those last given to the body before the application of color. Then stopper up with hard stopper, to which a little turpentine is added, to make it sand-paper easily. Then give the wood parts two coats of quick lead, mixed of dry lead and lamp-black ground in gold size, and thinned with turpentine. The whole is next sand-papered thoroughly, when the grain will be found well filled and perfectly smooth. A thin coat of oil lead color is next applied, and finally sand-papered, and at this point any joints or open parts between the tire and felloes should be carefully puttied up with oil putty. A coat of color-varnish follows, and a second coat of same to which more varnish is added. The gears are then flatted and striped, another light coat of clear varnish is given, flatted, and the fine lines given, and the whole is then finished with wearing varnish :—

Below is the synopsis of the foregoing.

2 coats lead color,
stoppered up.
2 coats quick-drying lead,
sand-papered thoroughly.
1 thin coat of oil lead,
sand-papered, and puttied up.
2 coats color-varnish,
flatted and striped.
1 thin coat clear varnish,
fine lines given.
1 coat finishing varnish.

—

9 coats from beginning of color.
5 " in preparation for color.

—

14 coats in all, upon carriage parts.

In conclusion, Mr. Editor, I will say that I have used the process which I have described in detail, for twenty years, and never knew the rough-stuff to crack. It is a long job, but it is a sure one. By allowing each coat sufficient time to dry thoroughly, the quality of durability is insured, and I think this is the reason why our English painted carriages generally stand so well. Burning off a job for repainting is a very exceptional case in England. Indeed, during an experience of thirty years, I have never had more than three or four jobs to burn off; and in cases where it becomes necessary, it is where a carriage has had very bad usage, or has been exposed to the action of ammonia. Generally, we merely rub down to the rough-stuff; and in most cases we find that sound and firm, and a good foundation on which to paint over.

I will try and write you again some time.

Yours truly, W. H.

LEEDS, YORKSHIRE, England.

Painting Railway Cars.

We give below the rule for painting railway cars which is employed by one of the largest and finest railway companies in this country.

3 coats of lead.
2 " " rough-stuff.
  Rub with lump pumice and water.
1 coat of lead (same as first).
2 coats of body color (dead).
1 coat of varnish color.
  Rub down with ground pumice.
  Letter, stripe, and ornament.
1 coat of rubbing varnish.
  Rub down.
1 coat of railway body varnish, or 2 coats, where there is sufficient time.

It will be seen that by this process, the car receives eleven or twelve coats. This company is now experimenting with the permanent wood filling, with a view to dispensing with the first three coats of lead. If the one coat of filling does the work of three coats of lead to their satisfaction, it will allow them a great saving in time and trouble. Several railway companies have already adopted the permanent wood filling with this result.

Painting and Trimming.

To finish a fine coach in the most tasteful manner, great care should be taken in seeing that the colors employed in painting and trimming are not only pleasing in themselves, but that *they are harmonious.* For instance, if the inside linings of a coach are of brown satin, the painting should in a measure follow this color, or be of a color which harmonizes well with the shade of brown. In England the coach builders generally observe this rule in reference to colors: *the base of the painting is determined by the color of the trimming, and the striping by the laces.*

Imitation Cane-Work

Is extensively used by English coach builders. There are two varieties, called the "tubed" and "perforated." The former is supplied to measurement at 3*s.* 6*d.* (88 cts.) per square foot, or in rolls 36 feet in length and 2 feet in width. The "perforated" is sold in pieces two yards long, and varying in width from a large size to the "flat pattern" of the same width as common split cane, which it exactly resembles.

The method of applying this sham cane-work is as follows: A mixture of whitelead and Japan gold size is first applied to the panel, and when dry the panel is varnished. When the varnish is about half dry and still tacky, the cane-work is pressed down upon it firmly, and will adhere. The work is then surrounded by a gutta-percha beading, which gives a neat finish, and a coat of varnish is applied as usual.

Difficulties in Carriage Painting.*

BY J. S. LEGGETT.

Every carriage painter who has become a master of the art in all its branches, has undoubtedly done so by perseverance and experience. Since we have many difficulties to encounter from the use of inferior qualities of material, which are so frequently manufactured for the trade, persons deficient in the natural faculty of judging and comparing colors will not be as likely to succeed as those with a natural taste. However, a practical knowledge will overcome this difficulty to some extent. I will not dwell on this subject here, but will proceed to show some of the difficulties that come under the observation of every carriage builder.

There are but few shops in this country, where painting is done, where more or less of the work does not crack after the vehicle has been in use only a short time. This occurs sometimes from the use of bad material, but more frequently through the fault of the mechanic. Carriage manufacturers sometimes think filling in bodies is but a simple matter; therefore it is left to apprentices or inexperienced workmen. As long as work is done in this way, so long shall we have unsubstantial painting. I do not oppose apprentices. It is necessary they should be admitted into shops and receive instruction, that they may take the place of those passing away. But I do contend that they ought not to be allowed to do work that requires so much care as that of filling in bodies, until they have a practical knowledge of less important branches of the business.

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* New York Coach Maker's Magazine.

As there are many different substances used for rough stuff, it would be useless for me to recommend a way to prepare any one of them, to make a hard and durable surface. English filling, and similar substances, that become hard and brittle when dry, ought to be made slightly elastic with oil and varnish; otherwise they will most invariably crack.

Another difficulty I am led to notice, is that of the cracking and flaking off of the paint from the carriage parts. I shall not attempt to offer any suggestions on the system of lead painting in carriage work, but will at once recommend something I think more applicable to the wants of the carriage painter. I have been using for some time the Permanent Wood Filling with satisfactory results. It does not become hard or brittle, and therefore will neither crack nor allow the superincumbent coats to peel off, as when the old method is followed. There are some that persist in the old system of doing work, thinking any new invention foolish and useless. To all such I would point to the improvements in mechanical art during the last ten years. Where such things are visible, we cannot hope to theorize to advantage for those who will not be thus convinced. I do not wish to convey the idea that we should experiment with every mixture manufactured, patented, and sold throughout the country; but when we find anything that really proves worthy of our attention, let us buy it, and use it with care.

Improvements in Coach Painting.*

BY J. S. LEGGETT.

Is it going to require three long months to paint a carriage when discoveries have long since been made to convey messages thousands of miles within a flash of the vivid lightning? when machinery has been invented to carry us over the ground on wheels at the rate of sixty miles per hour? We are living in a country which is the seat of civilization, refinement, and luxury. Mechanical intelligence and enterprise are fast taking labor from the hands as it were, and placing before it a more inexhaustible power.* So it is useless for us to argue the propriety of the old and long process in carriage painting, yet many claim that it is the only proper method. Men have not discovered ways of painting carriages by machinery, but they are making vast improvements in materials used. It was once thought necessary to take ninety days to paint a coach in order to have a durable surface; but, at the present time, some of our largest establishments in this line of business are turning out very beautifully finished vehicles in twenty-six days. The old system of lead painting has been abandoned by a large number of shops, and an article called "permanent wood filling," has been substituted. We formerly applied a coat of oil priming and let it remain at least seven days, after which we gave the body from three to five coats of lead, letting each coat stand three or four days before the English filling or a similar substance was applied. We now give the job one coat of the wood filling, and after it has remained four days only it is ready for rough stuff. And I will say here I sincerely believe if the following coats are properly prepared and applied over the wood filling, the latter will make a more durable surface than the first. At the same time we have used less stock, exhausted less labor, and finished the work in less time, giving better satisfaction to the customer, to the employer, and to ourself.

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* New York Coach Maker's Magazine.

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* Three tons of coal represent the labor power of a man for his lifetime. Richard Garsed, Esq., of Frankford, Pa., manufactures, in every day of ten hours, 33,000 *miles* of cotton thread—obtaining from *seven tons* of coal the necessary power. Supposing it possible for such quality of thread to be made by hand, it would require the labor of 70,000 women to accomplish this work. Can it be cause for wonder why the diversification of industry is the one and only road to freedom and civilization as well as to National power?—H. C. B.

Do not think I am recommending this system of painting for the benefit of the invention, or the manufacturers of the fillings. No; on the contrary, I am writing for the benefit of carriage builders and painters at large, for no doubt some have condemned the above system simply because they have not tested it properly or long enough to become acquainted with its nature, or to appreciate its merits.

In conclusion, allow me to ask one question: Has there ever been any substance introduced in a paint shop, that, when only one thin coat is given (previous to the color), will protect a carriage, especially the iron work, through the test of weather and climate equal to the permanent wood filling?

Boiled Oil

Should never be used by the carriage painter, unless it be for mixing striping color, or with transparent colors that need to dry glossy, or with carmine, lake, and ultramarine blue, which are very bad driers, so that it is necessary to add a large quantity of drier when these colors are mixed with raw oil. Even in the cases which we have mentioned, varnish may take the place of boiled oil, and will answer every purpose, and it is *still better to grind the colors in Japan gold size and add sufficient oil to make it work free.* If boiled oil should form no part of any color mixed in the carriage shop, its absence would be very beneficial to the durability of work.

Gilding.

A little pamphlet called the "Miscellanea," published in Philadelphia, includes the following suggestions on this subject:—

"To lay gold-leaf well requires careful preparation of the surface, a certain consistency of the size, which should be laid on evenly, and careful handling of the leaf while applying it. Fat 'oil gold size' is used for work requiring great durability, such as omnibuses and railway cars. For ornamenting and striping carriages, either rubbing or English finishing varnish may be used, but they are treacherous, as the edges on broad striping often dry before the inside and give a ragged appearance. For hurried work, a regular 'gold size' must be used. The English method of preparing the color in size on which to lay the gold, is to grind together red oxide of lead with old and thick drying oil, and before using it is brought to the proper consistence by adding a little oil of turpentine. Size, when too thin, will curdle and run, and when too thick will give heavy edges and diminish the brilliancy of the gold. The outlining pencil should not be so narrow as to lay on a heavy edge that cannot be worked back, and a short pencil is best for filling in."

We give two additional hints which have been suggested to us by reading the above. In applying "gold size," should the size become set in the pencil and the painter be obliged to wash it in turpentine, he should be careful not to continue his work until the turpentine has dried from the pencil, as that would dilute the size, and make it too thin at the point where he begins to stripe again. We have often seen the appearance of a job made unsatisfactory by not observing this precaution.

The best way of applying the gold leaf to the sizing is to use wax, rubbing the tissue paper with it a little. The gold will then adhere to the paper, and may be readily cut into any size required.

Permanent Wood Filling.*

In 1867, there appeared, under the agency of Valentine & Co., a new method of painting carriages, called, from its inventor, the Piotrowski method, and this has been found to possess such advantages over whitelead for the purpose of filling the pores of wood that it has superseded the use of the latter in most of the leading coach factories in America. In the Piotrowski method, a liquid called "Permanent Wood Filling" is applied to the bare wood, one coat being given to bodies and two to carriage parts. This closes the pores, holds the grain immovably in its place, and is so permanent in its effect that neither exposure to dampness or atmospheric changes, nor the vibrations to which a carriage is so subject, can act upon the grain.

Among the chief advantages which this filling has over lead are its *elasticity*, whereby it prevents flaking and cracking; its *anti-damp* nature, whereby it effectually resists moisture; its *economy* in saving several coats of paint; its *freedom from all unhealthful qualities*, and the extreme *durability* which it imparts to work, holding out and preserving the subsequent coats of paint and varnish. The permanent wood filling is far more effective than lead for thus protecting and preserving, and the reason is obvious. Paint simply forms a coating *upon* the wood, and can only protect so long as that coating remains unimpaired; whereas, the "filling" enters the pores and permanently closes them, thus hardening the wood itself, while but little remains upon the surface. When wood has received one coat of the "filling" it is preserved by the hard and impenetrable character which has been *imparted to the wood at the surface*, and not, as when treated with paint, by a coating which remains deposited *wholly outside of the wood.*

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* Prepared expressly for this volume.

A New Process for Determining the Comparative Value of White Lead.*

By Prof. C. F. CHANDER, of Columbia College, N. Y.

To determine the comparative value of whitelead, it has generally been considered necessary to submit the samples to chemical analysis; an operation which can only be performed by a skilful chemist, and which, if carefully executed, requires much time, and involves, consequently considerable expense.

It is therefore extremely important that a simple test should be devised, one so easy of execution that it may be applied by all persons interested in paints. Such a test was recently suggested to me by a person who has had many years of experience in the whitelead industry, and who desired me to submit his plan to a careful examination to test its reliability.

This I have done, and the results are so satisfactory that I desire to place them before your readers, that those interested in the purchase and use of whitelead may avail themselves of the test.

Properties of Whitelead.

The great value of whitelead as a pigment depends upon its opacity, or, as painters express it, its "body," or "covering power." Pure whitelead differs in opacity to a limited extent, according to the process by which it is made; that prepared by the Dutch method having the greatest covering power. The commercial varieties of whitelead differ, however, to a far greater extent, owing to the extensive adulteration which is now practised; sulphate of baryta, or barytes, a very heavy mineral, much cheaper than whitelead, being the chief adulterant employed. The objection to the barytes is its transparency or want of body; it is not opaque, and consequently it does not cover well. A much larger quantity of the adulterated paint is required to produce the desired effect.

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* From The Scientific American.

There is another objection to barytes; it has no affinity for the oil, and consequently, when the adulterated paint is applied to surfaces which are exposed to the weather, as on the outside of houses, the oil quickly disappears, leaving the pigment loosely attached, and ready to be washed off by the rain. Such paint rubs off readily upon our clothes when we come in contact with it.

Whitelead is a compound of carbonate and hydrated oxide of lead, which unites with the oil to some extent, producing a hard surface, which resists for a much longer time the action of the elements. Oxide of zinc has a similar property.

From these statements the importance of a simple test of the quality of whitelead will be readily seen.

The Test.

The value of whitelead depends upon its opacity; the more opaque it is, the more completely will it conceal a dark color. The test consists, therefore, in mixing a definite quantity of a dark pigment with a definite quantity of the whitelead, spreading the mixture on a suitable surface, and noting the tint produced. In my experiments 100 grains of the pigment whitelead ground in oil, as it comes from the mill, were mixed with one-half grain of Eddy's best lampblack, and four drops of boiled linseed oil. These substances were thoroughly incorporated, and then spread upon sheets of window-glass, 6 by 12 inches, with a steel spatula. A few of my experiments will best illustrate the test. Pure carbonate of lead and pure sulphate of baryta, both ground in oil, were employed; one-half grain of Eddy's dry lampblack, and four drops of boiled linseed oil, were mixed with—

	Whitelead.	Barytes.	Color produced.
1st. .	100 grains	0 grains	Light drab.
2d . . .	95 “	5 “	Slightly darker drab.
3d . . .	90 “	10 “	“ “ “
4th. . .	66⅔ “	33⅓ “	“ “ “
5th. . .	50 “	50 “	“ “ “
6th. . .	33⅓ “	66⅔ “	“ “ “
7th. . .	00 “	100 “	Black “ “

The specimens were submitted to six different persons successively, and all agreed in pronouncing them as above recorded. Five per cent. may therefore be considered the limit of the accuracy of this test.

Oxide of Zinc.

As oxide of zinc is often mixed with the whitelead, experiments were made to determine the effect of this pigment upon the tints. The best American zinc-white was employed. One-half grain of lampblack, and four drops of boiled linseed oil were mixed with—

	Whitelead.	Ox. of zinc.	Barytes.	Gave color.
1 . . .	33.33	33.33	33.33	L't bluish drab.
2 . . .	50	25	25	Darker “ “
3 . . .	50	12.50	37.50	Still “ “ “
4 . . .	50	6.25	43.75	“ “ “ “

The tint of the mixtures containing oxide of zinc was quite different from that obtained without the addition of this substance; while with whitelead alone, or whitelead and barytes, the color was a pure drab; the presence of six and a quarter per cent. of oxide of zinc was sufficient to communicate a very decided bluish tint. I think as little as two per cent. of oxide of zinc would make itself apparent in this way. This difference in tint makes it a little difficult to decide between two samples of adulterated whitelead, when one does, and the other does not contain oxide of zinc; as between tints so different in character, it is not easy to decide which is the darkest. In doubtful cases, however, this difficulty may be overcome by adding to both samples the same weighed quantity of oxide of zinc, say ten grains to each.

The colors communicated by the lampblack will then be of the same bluish tint, differing merely in intensity.

The only practical objection to this method of testing will arise from the difficulty of weighing half a grain of lampblack with sufficient exactness.

In my experiments, a chemical balance, which shows the thousandth part of a grain, was employed. The practical painter, however, will have no difficulty in applying this test with sufficient accuracy, if he will weigh out in ordinary scales, say 100 ounces (6¼ lbs.) of each sample to be compared, adding to each half an ounce of dry lampblack and an equal quantity to each sample of boiled linseed oil. After mixing the lead, black, and oil together, *very thoroughly*, spread each sample on glass, wood, or other smooth surface, as nearly alike as possible, when the difference in depth of color, produced by the black, will determine the comparative value or body of each sample.

The sample *most discolored* will have the *least body*, and that *least discolored* the *most body.*

Another very simple test for determining the comparative value of *any white paint* ground in oil, was suggested by the same person—the correctness of which I have fully demonstrated—namely, weigh out, say 100 grains of each paint to be compared, add three drops of linseed oil to each, and spread them with a steel spatula on sheets of glass, 6 by 12 inches, as nearly as possible in the same manner. Place the samples thus prepared between yourself and the light, and you will have no difficulty in deciding which is most opaque. The sample which has obscured the light the most, or appears the darkest, when held between yourself and the light, must have the greatest body or covering capacity.

To apply this test to *dry whitelead* or *dry zinc*, you should add 18 or 20 grains of linseed oil to 100 grains of paint, instead of 3 grains, as recommended for paints ground in oil.

Conclusion.

After having made a great number of experiments with these tests, I am satisfied that when they are applied with ordinary intelligence, they will not fail to determine the comparative value of the different grades of white pigment. I would advise every person who makes use of these tests to begin by preparing a series of standard plates for comparison, selecting samples of paint obtained from the most reliable makers.

Vermilion.

We take pleasure in presenting to the attention of our readers the following communication, which has been received by us from a practical painter who handles the brush daily, and who is evidently no stranger to the use of the pen, as is shown by the expression of the following ideas upon the :—

Darkening of Vermilion.

Having read with much interest the article regarding vermilion, which appeared in the September number of "The Hub," and believing that a due ventilation of the ideas and experience of practical painters cannot but prove of advantage to all who are interested in the paint shop, I will tender a few ideas of my own upon the above subject, and will show the results of several experiments which I have made with this beautiful but treacherous pigment.

A momentary consideration of the composition of this color may lead us in the right direction towards solving the problem of its discoloration. Vermilion is the sulphide of mercury, and as combined artificially, is originally *black*, as are the sulphides of lead, iron, etc. By the process of sublimation, the black sulphide is reduced to a vapor, and after condensation becomes, without any change in its atomic relations, the vermilion of commerce. This is the simplification of its composition, nor is it necessary, in this connection, to enter into the minutiæ of the process. Now, the cause of discoloration is the tendency of the red sulphide to return, under certain conditions, to its original black color.

The question which next arises is this: "*What are the agents which lead to this reduction?*" In reply to this. I would state that in my conviction the principal agent, with which the painter has to contend in this connection, is the sun. The reduction is an effect produced by that quiet but wonderful chemical agent—*light*. In support of this assertion I would mention the following experiment: Paint two panels from the same pot of vermilion, and put one in a dark closet and expose the other to every day's sun; it will be found at the end of a year that while the first is as bright as when first applied, the latter is considerably darkened.

Regarding the earthen pot suggestion of your correspondent—from which it is argued that the darkening of vermilion may be caused, sometimes, by the chemical action of the sulphide upon the tin pot, and the formation of sulphide of iron or sulphide of lead—I can regard it with but little favor. It may be possible that if vermilion be mixed in a clean metallic pot, a slight current of electricity may be induced, which may have the same tendency to promote the reduction of the red sulphide as in the case of light, but as a rule, the dishes of the painter are entirely coated on the inside with hardened and insoluble stratas of old colors, and there is no collusion between the color last used and the original material of the pot.

The query which your correspondent puts in regard to the *use of oil* in connection with vermilion, I look upon as quite pertinent, for I have found by my own experiments that the best protection for vermilion, when exposed to the sun, is that it should dry solidly to the groundwork before being varnished, and a large proportion of oil used in its composition, would of course interfere with this result. I once had occasion to observe, during very cold weather, a body painted with vermilion, which was so placed that while one side was exposed to the drying heat of a stove, with the thermometer at from 70° to 80° Fahr., the air was so cold on the other side that water would freeze. At the end of three months, the side of the body that stood towards the stove was bright, while the other had turned as dark as Indian red. I attributed this result to the fact that the vermilion on the cold side of the body had not dried solidly. This led me to make a series of experiments, as follows :—I prepared a panel, and to it applied vermilion which had been combined in twenty-four different ways. I exposed this panel for a year in a position where the strongest rays of every day's sun would strike fully upon it, and at the end of that time I found that while the color mixed with oil, acetate of lead, and spirits was quite bright, *all the specimens containing any admixture of varnish had become nearly black.* This has led me to believe that varnish should never be used in mixing vermilion.

From these and other observations, I am satisfied that the best plan of painting with vermilion that has come to my knowledge, is to prepare a foundation of flesh color, dried solidly, and to give one light coat of vermilion mixed with oil, acetate of lead, and spirits, used in such proportions as to dry solidly and quickly, and to observe that no varnish is applied until this color coat is perfectly hard.

I have at present no remarks to make upon the chemical relations existing between the vermilion and acetate of lead. I present the above as the result of my own experiments, which I consider as being far from complete, and I shall be pleased to note any suggestions or facts which may be offered by others, who have considered the interesting phenomena which attend vermilion.

Vermilion Again.

The darkening of vermilion, of which your correspondent writes in the September number, is a subject of great practical importance to the painter, and it is by comparing the views of many practical painters that we may hope to obtain a solution of it. I therefore take the liberty to offer my opinion of its cause, and, if not correct, I can only hope that it may help to draw out the correspondence of others, and lead in the end to right opinions.

You suggest that the darkening of vermilion might occur from using tin cups, whose iron or lead might combine with the sulphide of mercury, and form sulphide of iron or lead, which you say are dark colored. But theories, however plausible, cannot invalidate facts derived from experience, when we are positively sure of the result that experience has given. Allow me then to revert to my experience.

Perhaps as early as the use of vermilion was known, and ever since, it has been compounded with whitelead (carbonate), or redlead (oxide), without the workman ever discovering that it tended to darken the color; and I believe the celebrated Albany coaches, that were so elegantly painted with vermilion forty years ago, never disappointed the painter by turning to Indian red, as is now-a-days often the case, although in those times painters were no more particular than at present about what kind of a dish they painted out of. With these facts before us, it would seem that the theory of iron and lead does not solve the question. There must be some other cause. Let us compare notes a little in regard to present and past painting.

It was about twelve years ago that I first noticed that vermilion turned dark, and, following up the matter, I learned from the stage agent that they were painted in a Western city, together with other facts in regard to the manner of doing the work, which I thought gave me a clue to the cause of this result. It seemed that the builder was using a receipt for preparing boiled oil, as it was called, which was in fact nothing more than the addition to raw oil of some kind of drier, which darkened it and gave it drying quality. As this maker's work had previously been good, I believe the darkening of his vermilion was due directly *to the drier used in this prepared oil.*

"But," you say, "boiled oil is used very little now-a-days. Raw oil has taken its place in all the best shops. How then does this account for vermilion's darkening to-day?" To this I would reply, that where the same result is produced when raw oil is used, I still attribute the darkening of the vermilion to *the drier*, but now it is *the drier used in the Japan.* Boiled oil was discarded. Raw oil took its place, and more Japan was necessary in drying it, and I am well satisfied that it is the drier used in Japan that destroys the beautiful glow of vermilion. Pure shellac dissolved by heat, in the old-fashioned way of making Japan, will not darken it; but, in this fast age, bad driers are often used, and it is only necessary to give a name and a price below that of the genuine article, and among the diversity of people there will be found enough who will try to make it answer the purpose. It is *to the drier* then that *I attribute the darkening* of vermilion.

Now as to the remedy. For a few years past the writer has not been in the painting business personally, but he has retained a great interest in that which was his life-work, and more especially from the fact that a friend is a portrait-painter. Of all the branches of painting, this is *the* one that requires the strictest attention to the preservation of colors. Raw linseed oil is used, and when a drier is necessary above that which the tube paints contain, "Japan Gold Size" is preferable to anything I know of. This has, for the last three years, been used in connection with all kinds of paints, vermilion included, and no trouble whatever has been experienced from the color changing. Neither does it curdle in the paint, so as to make it difficult to work with a pencil brush, even when used in striping the most delicate lines. I know also that "Japan Gold Size" is used by several of the best carriage-makers with the best success, and believe that with its use vermilion will cease to cause trouble.

HENRY HARPER.

Vermilion Again.

We have further correspondence regarding vermilion, its beauties and defects, and how to remedy the latter, and did our space permit, we should be happy to give several of these letters in full. But as our present number is a four-paged one, we shall be obliged to restrict ourselves to giving merely the principal points in a few of these letters.

"New York" writes: "I have noticed that carriages painted with vermilion, that are imported from England, always retain their brilliancy and purity of color much better than carriages painted here. We use the same vermilion, so why this difference? I have considered this thoughtfully, and have made many inquiries into the differences in the way of painting in England, and have come to the conclusion that the darkening of vermilion in America is due to a great extent to the use of the driers employed. We work here on the railroad method, *speed* being a requisite—sometimes *the* requisite. In England they work much slower and with greater care for durability. No driers, that are so powerful as to be hurtful, are mixed with the paints, and the under coats of varnish are not of the dry brittle quality here used, but they approach nearer to the quality of a finishing varnish. These precautions take time of course, a great deal of time, but greater durability is effected. Now I think these strong driers used in America act upon the color of the vermilion, and that if we used Japan gold size as the English do, and more elastic rubbing coats, our vermilion would retain its beauty longer."

"Brooklyn" writes: "I have experimented a good deal with vermilion during my long experience as a painter, and feeling a deep interest in the subject of paints generally, your correspondence upon this subject has been doubly interesting to me. I think the mixture of a little *orange mineral* with vermilion helps to preserve its color. I have carefully compared work done with this mixture with that done with pure vermilion, and have become so far convinced of the utility of the admixture, that I have now used it for several years and with very satisfactory results. I think it is worthy the attention of some of your readers who are interested in the subject, and I would be happy to hear from some of them upon it."

Mr. Scott, of 8th Avenue, New York, had added *flowers of sulphur* to his vermilion for several years, and thinks he sees a marked result in the increased permanence of its color. He argues that it counteracts the action of the driers in some way. This agrees with the suggestion made by the "Scientific American," as quoted by us in the December Hub.

"B." writes: "When my colors don't flow readily, I sometimes grind a little soap in with them, and it has a very satisfactory effect, giving them a fine degree of fluency, without tending to destroy their color. I always grind a little soap with my vermilion, and I have good success in its retaining its beautiful color. The soap makes the color flow splendidly. I don't think turpentine is good for vermilion, and I know that much oil will hurt its color. This is a kink in painting which I don't think is much known, but if it is worth anything I shall be happy if others can take advantage of it. If worthless, as proved by the experience of others, I shall be glad to know it and to be set on the track of something better. I look upon the cry of 'ventilation!' which you urge, as a very important one to the painter, and shall be glad to see the subject of paints ventilated, and the experience of each painter allowed to accumulate with the experience of all."

"Boston" writes: "I am very carefully testing whether mixing flowers of sulphur with vermilion will help retain its color, as you have suggested. I have prepared a panel with vermilion mixed in a great variety of ways, and have hung this panel in an exposed position. After it has remained there long enough to be thoroughly tested I shall report to you of the result. I shall also examine the board several times in the mean time, noting the appearance of the colors. I have mixed Japan gold size with some of the vermilion, and think this may be better for the color than common Japan, or any of the driers commonly used."

It will be seen by the above that the interest of the painters has been awakened, and we are encouraged to believe that from this agitation of the subject there shall be good results. Will the painters aid us in furthering this?

Paris Green.

Mr. Editor: It has been mentioned in The Hub that Paris green is a very delicate color, and that many painters have trouble with it. I have had considerable experience with it during the past five years, having painted most of the cars now running on the Harlem road, and I have thought that a few words on the result of my experience with it might be interesting to your painter readers.

Of itself I do not think Paris green is a difficult paint to manage, but it is of a delicate shade which is easily affected by outside causes. Of itself it is a good and permanent color, but the trouble of its changing, which is so commonly experienced, is generally due to the varnish used over it. This can be proved very easily. I have a panel before me which was painted with this green eighteen months ago and varnished, and now it is of a very dark and dirty shade. But by pumicing it until the varnish is removed I find the color beneath it is still of the original shade almost precisely. As with several other colors, the continued beauty of Paris green depends very materially upon the paleness and purity of varnish which is used over it.

In addition to the above, Paris green needs more than ordinary care in mixing, from the same reason that its shade is so easily changed. I mix it with whitelead, and grind as stiff as possible in oil and a little Japan.* As it settles badly it should be stirred frequently during application, and it should be worked as rapidly as may be, the whole panel being laid on and not touched again, otherwise it will give a streaky appearance. J. H. WILL.

Varnish Rooms.

There is in the process of manufacturing a carriage no part of the work which is more essential to a fine finish than that of varnishing; for however nicely the carriage may be finished in the wood, and however nicely the levelling coats and colors may be applied, a bad coat of varnish may spoil all. The process of varnishing is of itself a very delicate one, and requires long practice and great skill and judgment on the part of the workman who would do it satisfactorily; hence the best possible facilities should be afforded the varnisher, in the way of room, and its position and arrangement.

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* NOTE.—Japan gold size is preferable to Japan for mixing this delicate color, as it is very much purer in color.—ED. HUB.

We regret that the carriage-makers of the United States have not given more attention to perfecting the arrangements of their varnish rooms, and as we have been from shop to shop in many of the leading cities, we have become impressed with the belief, that this want of attention is due to the fact that manufacturers have not learned to appreciate the importance of this department of their factories, and that the subject needs to be "ventilated" by discussions and by mutual advisings before there can be a change for the better. There are few good varnish rooms in this country—*very* few. Consequently, there are plenty of poor ones, and for the sake of an example, which may illustrate those features of a varnish room which are objectionable and should be avoided, we will describe a certain poor one which we have in mind, and which we assure our readers is by no means the very worst of its class.

This shop is situated in the outskirts of a city. The varnish room is *a small one*, in the second story, and is directly over the blacksmith's shop, while above it is an unfinished garret in which stock is stored. The room has two windows, *which open only at the bottom. One window is shaded* by a large elm tree, which is considered very attractive, but as the room is dark, and this tree shuts out half the light which would otherwise enter, its shade is very objectionable. The light from the other window is partly obstructed by a *series of shelves, upon which are arranged a variety of varnish and Japan cans.* The ceiling and walls are of *rough boards black with age,* and here and there pictures have been hung. In the middle of the ceiling newspapers have been tacked up, in order to prevent the passage of *dust which rattles down from the cracks* between the boards, every time any one enters the third story.

It is not difficult to perceive that in such a shop the varnisher must be obliged to labor under many serious disadvantages. In the first place, his room is dark, whereas he needs the best light possible. Not only are the windows too few in number, and partly obstructed, but the walls and ceiling, being dark, cannot reflect and make the most of what light there is. Again, he has no proper ventilation, and this he must have in order to guarantee good work. The windows cannot be opened, for if this were done, an inward draught would be created and dust might be brought in. Even the cracks in the ceiling are rendered useless as ventilators, being covered with piles of lumber. Consequently, if you visit this shop on a warm summer day, you will find this room as hot as an oven, and the air so drenched with the moisture which comes from the rapid evaporation of the water upon the floor that it is difficult to see across the room. Every painter knows the effect produced upon varnish by a moist, muggy day; then who can expect that varnish will do its best in such an atmosphere as we have described. In the third place, the work in this shop is never safe from dust, for the walls and the ceiling being rough, they will hold a great amount of dust suspended, and this is liable to sprinkle down upon the fresh varnish whenever any jarring is caused by the workmen below, or by heavy teams, or even by the movement of the door, when the varnisher leaves the room at night. His work is therefore in constant danger of being spoiled in this way. If, under all these disadvantages, a varnisher is able to turn out perfect jobs even occasionally, he may be considered as eminently fortunate as well as skilful, and he cannot justly be blamed for frequent bad jobs.

As we have already mentioned, the shop which we have described is by no means the worst of its class, but is one that is looked upon by its owner as a "very comfortable sort of a place," and as we once heard him remark—"Anybody who can't dew good worruk in that 'ere shop, better jest go and try it with my gran'ther, who allus did all his varnishing in the back yard. That 'ere shop is where I done all my varnishing when I was a young un, and if there 's anybody can do betterer varnishing than me in eighteen forty, I'd jest like to look at him."

In past times it seems to have been the policy to set apart, for varnishing, the odd room which couldn't be used for anything else; whereas, the varnisher ought to have first choice, and should have the best situated and the best fitted room in the building. The varnish room should be the "parlor" of the factory, for it is there that the most delicate part of the operation is performed. In some new shops we are glad to say that some improvement may be noticed in this respect, but still there are very few that approach perfection.

Among the best we have examined of late, we would mention the varnish room connected with the new factory of Messrs. Danielson & Johnson, corner of Charles and Fruit Streets, Boston, through which we were recently conducted by the polite foreman, Mr. Holmenquist. It will be remembered that their old factory was partially destroyed by fire a few months ago, and great care has been taken in arranging the present new building. It is three stories high, including the French roof, and each story is divided into two large rooms, thus making six rooms in all. On the lower floor are the office and blacksmith's shop; in the second story are the wood-shop and show-room, and in the third story, the paint and varnish rooms. The varnish room is large, and is well lighted by six windows, opening to the east and west, and by two skylights. The ceiling is plastered, and the walls sheathed with pine, and the floor is made of hard pine closely matched. By means of the skylights, which are so arranged that they may be easily raised to any desired height, good ventilation is secured, and this important feature is also assisted during the summer months by funnel holes in the chimney. On account of the elevated position of the room, it is free from the dust from the street, and the walls and ceiling being bare and finished smooth, there is little chance for dust to lodge.

In conclusion we will briefly mention the several requirements of what we consider a model varnish room. These requirements refer to the railroad shop as well as the carriage shop, but more particularly to the latter, because the class of work is nicer, and also for the reason that in the carriage factory we find the faults are generally most serious. The paint room in a car-shop must of necessity be roomy, and this will help ventilation, and the light is generally good.

1st. *Every varnish room should have the best degree of light that is possible.* A corner room, with plenty of windows, is therefore to be preferred; and, if situated in the upper story, skylights will aid very considerably. The ceiling and walls should be white and smooth, as they will then reflect the rays and greatly increase the degree of light. Rays of sunlight must not be allowed to fall directly upon work, and each window should therefore be provided with a white curtain, which can be drawn when necessary.

2d. *The varnish room should have a perfectly arranged system of ventilation.* The windows should all be made to open at the top, and one or more of them ought constantly to be opened for an inch or two. If the room is in the upper story, as is usually the best situation for the varnish room, skylights will be found to give the best ventilation.

3d. *Every precaution should be used to prevent the presence of dust.* In the first place, the walls and ceiling should be finished smooth, so that dust cannot find place to lodge. Plaster, with hard finish, gives the smoothest surface, and we would advise its use in all new shops. When finished with wood, the boards should be planed and matched, and a coat of varnish or permanent wood filling added. In old shops, finished roughly, it is well to tack sheets of brown paper over the ceiling. In the second place, no shelves, cans, clothes, or pictures, should be allowed in the varnish room, as they are all liable to hold dust. The varnish room should be a *perfect void*—bounded by six blank smooth surfaces. Then let the room be carefully dusted, swept, and sprinkled, and two or three hours afterwards the carriage may be wheeled in lightly, and the work of varnishing can be commenced with some confidence. Some varnishers have a silk suit to slip on before entering the varnish room. This is a good plan, as they thus avoid carrying in much dust which would be likely to cling to their ordinary clothes. *Thirdly*, no one except the varnisher should be allowed to enter the varnish room. It should be the "*sanctum sanctorum*" of the factory.

4th. *An even degree of temperature should be maintained.*

For this reason, it will be seen that the best situation for the varnish room is in the northern end of the building or in the northeast corner, for there the sun will not lie in during the day and raise the temperature. Steam is the best method of heating the varnish room. When this cannot be employed, care should be taken to select a good stove that does not require constant attention, and this should be placed near an aperture in the wall, in such manner that it may be fired from the adjoining room; and furthermore, it should be inclosed in a tin or sheet iron casing made conical at the top, and this will prevent any dust from arising when the fire is replenished or the ashes are shaken down. The degrees of heat which are best adapted for varnishing range from sixty to about seventy-five degrees Fahrenheit, being about the same which make the temperature of the room seem comfortable to the varnisher. A good thermometer should be hung up, and great care should be taken that an even temperature is maintained during working hours, and until the varnish "sets." If possible, the heat should be preserved throughout the night.

Carriage Varnishing Rooms.*

We remember the time when nearly all the varnish spread on carriages was expected to dry in the open air, and scarcely such a thing as a varnish room existed in the whole land. Those days, however, have passed away, and manufacturers have come to think no establishment complete without a varnish room attached thereto. This "institution" has been particularly necessary since the introduction among us of the slow-drying English varnish, which could not possibly be used without it. And even with the best constructed varnish rooms, many mechanics find it a difficult job to turn out a perfectly well-varnished carriage, and the workman who is expert in this business deserves good wages.

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* The N. Y. Coach Maker.

There are several desirable requisites in a varnish room. If possible, let it front southward and have the frontage and ends well supplied with glass. Some of the windows should be made to slide, to admit ventilation when necessary. The whole front should be screened from the sun in the hot summer days by a canvas curtain on the outside, which, when not in use, should be rolled up near the top and protected from the weather by a broad roof, something after the manner of many awnings in our large cities.

The walls of all varnish rooms ought to be hard-finished in plaster, and the ceilings should be of pine boards, grooved and tongued and well-seasoned. This ceiling should be painted white for obvious reasons. Nailing canvas, paper, etc., overhead will serve no better purpose than to gather dust, simply *to fall when it is not wanted.* If old and dilapidated as we have seen some varnish rooms, the sooner it is reconstructed, the better it will be for the owner.

No room, however perfect, should ever be used for varnishing without first sweeping it out all over, ceiling, walls. and floor. After this is done, if not before, sprinkle the floor nicely with a watering-pot, and leave the room vacant for two hours at least. that the dust may become well settled, Finally, keep idlers out, choose a pleasant, still day if possible, and begin your work with earnestness, and as late in the day as will suffice to get through with the job.

Care of Varnish Brushes.

In the June number of The Hub, I noticed an article under varnishing, and how to do away with practical painters. I have been over twenty years in the paint shop, and I will give you a few words of my experience about brushes and turpentine in varnish. Your statements are correct, but on wearing body or English varnish the effect is more serious. In many cases it will spoil the finishing coat. In my opinion no substance will ever mix and thoroughly assimilate with varnish, when in a cold state. Turpentine is a very quick evaporating liquid and will always force its way to the top of the varnish, and when applied to a panel, will rise to the surface and give the varnish a *silky appearance,* as it might be termed, which takes off the lustre and brilliancy of the finish. The blame is then put to the credit of the varnish maker for not sending good articles.

But there is another way in which turpentine is introduced to disadvantage, and this is by cleaning the brushes with turpentine. I have worked in shops where the brushes were put in turpentine for half an hour to clean them. By doing this you produce the *silky* appearance over the half of the body on which you worked before the turpentine is worked out. The trouble does not end here, but the turpentine pressed out of the brush will divide the varnish and mix with it, and this will often cause it to be *streaky,* or to show brush marks.

The following about keeping brushes may be of interest to painters. Should any dirt collect in the brush while varnishing, or the brush drop on the floor, which will happen sometimes, then clean it out well in varnish, and before putting it away in the keeper, fill the brush full of varnish, and in time the dirt and dust will all settle to the bottom. By cleaning it with turpentine which is a very volatile substance, you will draw all dust and dirt up to the tin of the brush, and by using it next time you will work it all out, and in many cases spoil the job. Every brush should be well dipped in varnish before putting it back in the keeper.

I have used brushes now for eight years and never had them in turpentine. EXPERIENCE.

WASHINGTON, D. C.

Thickening of Varnish.

Greenland, N. H., asks: "When varnish thickens by age, what will best reduce it?" If corked properly, good varnish will not thicken to any considerable extent for a great length of time. When so heavy in body that it will not work properly, it is best to return it to the maker in exchange for some of greater fluency. It is possible, by adding spirits of turpentine and allowing it to stand for some time, to improve the working qualities, but it is so easy thereby to ruin the varnish that this is seldom advisable.

Hardening Varnish.

A newly-varnished carriage is liable to spot. To prevent this, wash the carriage with clear soft water, applying it with a sponge. This will harden the surface and prevent it from being injured by drops of mud or rain. Soft water is preferable to hard water for this purpose, as the lime which is present in the latter is liable to injure the varnish.

Black Body Varnish.

A New York correspondent contributes the following suggestions in regard to the use of "Black Body Varnish" in carriage painting:—

Being much interested in The Hub, I send you for publication, if you think it worthy, a brief synopsis of my method of using the "black body varnish," about which I have lately heard several inquiries. I was glad to notice that the matter was touched upon in your March issue by "Boston Painter." I confidently believe that when carriage painters become familiar with the virtues of this article, it will be found indispensable in the repair shop; and furthermore, that as they find it gives a much better black than ordinary methods on new work, it will be universally adopted for that also, as it has been in England, where I learned to use it under the name of "black Japan."

When an old job comes in to be touched up and revarnished, it is frequently very green, or the varnish has quite perished, and the painter is obliged to give it a coat of black color and varnish, and then, to make a good job, a coat of rubbing and a coat of finishing varnish must be added; whereas, *one coat of "black body varnish" with one coat of wearing body* over it, will make as good a job and a much better black. Should the lower panels be lake, green, or brown, proceed thus: for lake, grind a little Indian red in oil and mix with the black body varnish to suit any required tint, and should a lighter color be needed, add a small quantity of Munich lake; for browns, add burnt umber and Quaker green; and for olive green, add Quaker green and Dutch pink. Should the oil retard the drying, add a little Japan gold size. By following these directions the painter can make a color that will glaze the lower panels, and the next morning by putting a little ivory black in the black body varnish, he can go over the mouldings, and the next day rub and finish, thus making the job look like a new painted carriage in *three days.* On new work, two coats of black body varnish are required on a black ground, and for fine work a coat of rubbing, then rub and finish. If done properly, this will give the body a depth of color that *drop black cannot give.* On black carriage parts one coat of lampblack, one coat of black body varnish, then one coat of half and half black body, and quick rubbing, will make a fine surface to finish on, and one that is as superior in color to drop black, as the latter is to lampblack. EMPIRE.

Too Quick Drying.

"When varnish sets too quickly, is there any remedy?" To this question of a New Haven correspondent, we would reply that some varnishers mix a higher grade varnish with one that is too quick drying, and allow the mixture to stand for several days, until the two are thoroughly assimilated. For instance, a varnisher, using "hard-drying body" varnish, finds it generally sets too quickly to allow him time to work it properly. By adding "wearing body," and allowing it to stand, he will thereby remedy the trouble.

Uncorking Varnish.

Previous to using any varnish, and particularly a high grade coach varnish, it is urged by some painters that the cork should always be unloosed from the can for two or three days to allow the presence of air, which, it is said, removes a peculiar gas of turpentine that seems to be generated by varnish when long closed, and which is very likely to spoil the first job that is varnished from the fresh can. We give a communication on this subject addressed to us by a correspondent:—

"I lately bought a can of English varnish which had stood four months on the shelf of the dealer, and ordered my painter to use it on a coach body. To my surprise he objected to this on the ground that the can was so fresh opened.

'Why,' said I, 'it is well ripened varnish, and has stood four months on the shelf, so it is well settled and ready for use.' Still he objected, and argued that the spirit of the varnish would be so strong that it would strike into the surface of the rubbing varnish and give it the appearance of being sanded. This was new to me, so I ordered him to go ahead, and varnish the coach with it, and I would answer for the result. He applied it to one panel. It looked very fine, and I laughed at his fears and left him. But fifteen minutes later he called for me to look at it, and sure enough it was beginning to fulfil his prophecy. It seemed to eat into the rubbing coat, and gave an appearance similar to a varnished surface sprinkled with sand. I then admitted the wisdom of his suggestion, and having borrowed a can of varnish that had been opened some time, he removed with a brush most of that which he had applied, and flowing the panels with this varnish, the result was satisfactory. To prove further that it was the fresh opening of the can which had caused the first varnish to work so, he filled two glass bottles therewith, covered them with muslin to keep the dust out, and exposed them on the shed to the sun for three days. At the end of that time he finished several coaches with the varnish thus prepared, and it made a surface which I never saw surpassed for fulness and brilliancy."

This letter seems to sanction the caution which we have mentioned as being urged frequently by practical painters. We have heard of cases similar to the above, and have reason to believe that unsatisfactory results will often follow the use of a varnish which has been long confined from the air. It is very probable that this fact frequently induces a condemnation of a varnish which is first used on trial. No one ought ever to condemn a varnish until it has been tested several times.

Varnish in Colors.

In the case of making delicate shades of colors, such as emerald green, French gray, canary yellow, or very light blues, and there is not time to paint in oil, it is very important that the varnish in which the color is ground is of the purest and palest quality. We have known an instance in which a want of attention to this point caused considerable trouble to a painter. A sample spoke had been painted with French gray that was ground in very pale varnish, and a job was ordered to be painted of the same shade. The painter mixed the color as before; but he was at that time using another varnish which was of a darker color, and the result was that he utterly failed to produce the desired shade. He finally decided that his failure was due to the varnish, and that the color in it destroyed the tint of the paint, and he afterwards proved the truth of this supposition by obtaining some of the same varnish which he had formerly, and with it he readily produced the tint that was required.

Spotting of Varnish by Mud.

Mr. Editor: We have been using the best American varnish with satisfaction, for some time past, but we find one trouble. It is liable to spot when mud dries on it. Inclosed we send you a sample board which has been varnished for at least two months. We covered one end of it with mud, such as our work is commonly exposed to in this part of Illinois, and let it stand over night, after which we carefully washed it off by pouring water upon it, and wiping dry with buckskin. You see the result. We have denoted the end on which the mud was put, and you see the gloss on this end is nearly destroyed. In washing it, all parts of the panel were treated alike. Several carriages have returned to us, which had been covered with mud and washed, on which the effect was very similar. If you can, through The Hub, throw any light on this important question, we shall read it with great interest. We like the working of the varnish which we have very much; but if mud continues to affect it in this way, we shall of course be obliged to quit using it. We hope you will help us to discover the cause.

Robert S.

Virden, Ill., July, 1870.

We have carefully considered the panel sent us by our correspondent, and have talked with several carriage makers about it. In certain cases all varnishes are liable to retain mud spots, and this is particularly so with the highest grade of coach varnishes, including English, which are slow in drying. We are glad the subject has been brought before us, and there are some points we can speak of which may be useful to Mr. S. and to others of our readers who are troubled in a similar manner.

First, the Cause.—Our theory in regard to the cause is as follows: The mud which is found in many parts of the West has a very corrosive action upon varnish when allowed to dry thereon, and this effect has often been ascribed to the lime which exists in the soil of that region. But as lime cannot long exist in a caustic state, but speedily becomes a harmless carbonate when exposed to the air and moisture, and never occurs in nature in an alkaline state, this theory is improbable. We therefore look elsewhere. Any one who has travelled in the West and South must have noticed the extremely adhesive character of the mud in question, which, being composed in great part of clay, adheres with remarkable tenacity to surfaces with which it comes in contact. In our opinion, its action on varnish is similar to what takes place when oil stains are removed from a carpet, or from clothing, wood, or marble, by spreading a layer of pipe-clay on the spot. In this case, the oil is absorbed by the force of the capillary attraction with which the clay is endowed by reason of its porosity, and the stained surface is made clean. In the same manner, when the clayey mud is left to dry on varnish, the water evaporates and *the porous clay acts upon the varnish, absorbing a portion of the oil from its surface, and the brilliancy is thereby destroyed.*

Accepting this theory as the true explanation of the trouble, we next turn to the cure.

The Cure.—When varnish is thus deadened by mud, *its lustre may be restored gradually by washing frequently with cold water and by sunning.* Light and fresh air have a powerful influence in preserving a varnish, and when it is observed that it is growing dull, the carriage should be run out of the stable or repository and given a good sunning and airing. If advantage is taken of these restorers, our correspondent will undoubtedly find the carriages he mentions will look much brighter in October and November than they did at the time of his writing.

A Prevention.—This is still more important than the cure, for "an ounce of prevention is worth a thousand pounds of cure." We know of but one way to avoid the spotting of varnish in those regions where clayey mud abounds, and that is to *use a harder drying varnish*, during the summer months, *which would offer greater resistance to the absorptive power of the clay.*

Specks in Varnish.

We lately bought three cases of varnish of which we could not make a good job. We bought six different kinds of brushes, so as to give it full trial, but all to no avail. It looked, when applied, as if the job had been sanded; and while putting it on, these pimples looked so much like bubbles that I touched them to test whether they were grit or bubbles. I came to the latter conclusion. At that time I saw in The Hub an idea that varnish should be *aired*. I told my painter to air some varnish through the mouth of a glass bottle for three days. He did so, and I then varnished a job myself, commencing to lay it with a badger brush; but it worked as badly as ever. I then told him to wash out a bristle brush, and while he was about it, I continued to work the badger brush over the fresh-laid varnish; and I found this reduced the number of specks. In using the bristle I adopted the same plan of working the varnish as long as I could before setting, and my body was freer from specks than any job for months, but some still remained. Another feature of this varnish is that after it has been cut down, these specks are brighter, and they have a greasy feel. Now what is the matter, and where does the fault lie? Please answer me. Another thing I notice in The Hub corroborative of my own practice; namely, washing varnish to give it fulness and brilliancy. I have tried it successfully very often, but I cannot get my painter to do it.

E. M. H., of South Carolina.

Our Answer.

The occurrence of specks in varnish happens occasionally, and is of course a serious defect, particularly in the highest grades of coach varnishes. It is due to a variety of causes.

In the first place, there are three causes which are common and very obvious. 1. *Exposure of the open can* to dust. 2. Presence of *dust in the varnish room* during the time when the varnish is still tacky. 3. *Uncleanliness of the brush* with which it is applied.

Fourthly, it is often a fault in the manufacture, and is owing to want of skill in the process of melting, whereby *particles of the copal* separate on cooling, and remain for a long time suspended in the varnish.

Fifthly, *particles of the various driers* are occasionally found in varnishes, and this is due also to unskilful manufacture.

But the most singular cause of specks is the following, and it is one which has often appeared very mysterious, and it has frequently been pronounced by the painter as one of his misfortunes without any cause: It has been found that *high-grade varnishes absorb moisture from the air very readily, and further tests of the most careful character have shown that this moisture forms with the spirits of turpentine a crystalline hydrate, which separates in small grains*, having an appearance very similar to sand. It is these crystals which are the specks. Thus is the mystery removed. The painter will understand now that when he has a can of very excellent varnish, from which he finished a coach so satisfactorily yesterday, and happens to use it on a muggy day, and his job is filled with specks, it is not the result of magic, but the result of a fixed chemical law. And thus the business of painting and varnishing is one in which the principles of chemistry form the foundation, and the best painter is the one who is best acquainted with the application of those laws, although at the same time he may know nothing at all about the laws themselves.

In regard to prevention and cure of specks in varnish, these are different in the different cases. In the first three cases, the prevention is apparent. In the fourth and fifth, the varnish-maker must shoulder the blame—and the varnish too. The specks will settle, however, by long standing in a warm place; and if the carriage-maker sees fit to store the varnish awhile, the trouble may disappear. In the last case, the only way is to avoid varnishing a fine job on a very damp day.

In conclusion, we will add that it often requires much care, in the case of a specky varnish, to test with accuracy which of these six causes was productive of the defect; and we cannot point out to our South Carolina correspondent what the agency was in his particular case, but we think the foregoing hints will help him in ascertaining for himself. Oftentimes the varnish-maker is blamed very unjustly, and oftentimes the poor painter is likewise faultless. With a view to justice, no decision should be pronounced without first making a full and careful observation of all the conditions.

PRIZE ESSAY.

Japan Gold Size.

BY J. S. L.

Wood is of such a porous nature, that unless consolidated by some chemical process, paint and varnish will not protect it sufficiently to totally exclude the atmosphere, consequently the numerous pores are subjected to the alternate actions of the air, causing them continually to expand and contract. This shows at once the folly of applying a substance that does not retain elasticity. There are two very important things to be studied in coach painting; first, to form a surface hard enough to hold out the varnish and disguise the grain of the wood, and second, to have the first and intermediate coats of paint sufficiently elastic to adhere and yield to the natural action of the wood without cracking or flaking off. In effecting one of these results we are apt to effect the other, and nothing but the utmost care, on the part of both the manufacturer of the essential ingredients and the person who prepares them, can insure durability. Every practical carriage painter is aware that if he makes use of large quantities of ordinary Japan in his filling-up, etc., the results will almost invariably prove unsatisfactory, for the paint does not then retain sufficient elasticity to withstand the contraction caused by extreme cold, and it consequently cracks. On the other hand, if we use too much oil, the varnish will not retain its fulness. The wood drinks up the oil by degrees, drawing in the vital substance of the varnish and leaving the fibres visible, so that they appear to rise up on the surface of the wood. This shows the superiority of the "permanent wood filling," whereof the greater part penetrates the pores and becomes a fixed substance, there yielding to the action of the wood without causing the subsequent coats to expand or contract in the same degree, whereas lead remains upon the surface and the oil is gradually absorbed.

My object, in the foregoing remarks, has been to show the necessity, in forming a body of paint, to first use a pliable substance and then work up by intermediate degrees to a hard surface, so that the exterior coats may resist the interior action, hold out the varnish, and yet retain sufficient elasticity to withstand the changes of atmosphere. Now, in order to do this, we are obliged to dispense with an article long used in carriage painting, namely, Japan. In arguing that the great amount of unsubstantial painting done in this country is generally caused by the use of brown Japan, I shall undoubtedly meet with opposition, yet experience has so strongly confirmed the matter in my opinion, and many others, that I do not hesitate to make such an assertion. All paints, prepared with Japan as a drier or binder, will become brittle after being exposed to the weather for a time, and the reason why colors prepared in this way remain as permanent as they do, is because they are *sustained by the strength of the varnish that succeeds them*, and when they do give way they usually cause the varnish to crack at the same time.

Ordinary Japan contains large quantities of turpentine and ingredients that seem, in the manufacturing process, to eat up the elastic properties of the oil, leaving an unreliable mixture, with such a turbid appearance that spurious articles are often used by the consumer, undetected, until to his expense. I do not propose to write a history of Japan in this connection, or to name the different materials which compose it, for such matters have long been before the public, and it is useless to rewrite them. I design rather to show its effects, and to dwell on the necessity of adopting a more expedient article.

My curiosity was once aroused on this subject, and I tried a series of experiments in search of something which would do away with Japan. By the use of hard-drying varnish, oil, etc., I prepared a filling-up that proved very satisfactory in some respects. Yet my anticipations were not fully realized, for although this method withstood the most severe tests without cracking, the substance was not hard enough to resist penetration, and consequently the varnish ceased to retain its brilliancy. I then saw the necessity of using an article that would, without injuring the durability, *harden* the above mixture, and after considering the subject earnestly, was led to adopt "Japan gold size," which proved to contain the desired qualities. I have investigated it thoroughly, and have found it to be an indispensable drier, with merits worthy of more general appreciation in this country.

If I should ask the question—"Why is the finish on vehicles imported from England and France more durable than on our home manufactures?" I should probably receive an answer like this: "Because in England and France they make use of more oil, and use more time in finishing a vehicle." If *durability alone* was to be considered, to the exclusion of brilliancy, this answer might be satisfactory, but, for reasons heretofore stated, it will be seen that only a limited portion of oil can be used and allow the varnish to retain its fulness and brilliancy. Therefore we must inquire further in order to form a correct opinion. In looking beyond the limits of our own country, the only material difference we can observe in the method of carriage painting is the special attention paid to mixing rough-stuffs and colors, and the use of Japan gold size in place of Japan. Japan gold size has been a standard drier in England for many years on account of its powerful drying quality and its durability. This dissimilarity alone is enough to make their work better than ours. Japan gold size is of pale color, having strong drying qualities, so that it requires a less quantity to effect the drying, therefore it may be used in a small proportion and in very delicate colors without destroying their brilliancy or durability. The article is now manufactured in this country, and is superior in color and equal in drying properties to the English, which saves the expense of importation, and we are glad to know that it is becoming indispensable in the most noted shops in this country, and trust that ere long it will be used in every carriage factory. Common Japan has proved to be unreliable, and has undoubtedly impaired the reputation of many a practical mechanic, who will be glad to become acquainted with a reliable substitute.

Having endeavored to show some of the many advantages which Japan gold size possesses over ordinary Japan, I leave the matter to be considered and tested by those who feel an interest in the advancement of mechanical art. Let us study the mysteries connected with the painter's trade, and by extending to others their information of the result of such experiments, we may hope that ere long we may approach to perfection, and so prepare the way that those who succeed us may be able to step over the obstacles which have proved to be our stumbling-block.

Flatting Varnish.

It has occurred to me that a brief article on the use of flatting varnishes by London painters would be of interest to your readers, and I believe there are points in this subject which the American painter would do well to examine closely. As I have mentioned in a former letter, the great consideration with the carriage painter in England is *durability*. As one means, and a very important means, of attaining this, he takes great pains with the foundation of his work, rightly arguing that he *must make each separate coat durable, if he would make the entire job so.* In the first place, we make our rough-stuff and color coats more elastic than the American painter does. To illustrate this I give an

English Receipt for Rough-stuff.

Grind 1½ lb. dry lead stiff in turpentine.

Grind 4 lbs. ochre, or English filling, stiff in turpentine.

Mix the two, and add ½ lb. of tub lead.

Add 1 pint of Japan gold size, and about ½ pint of the bottoms of wearing varnish. Reduce with a little turpentine if necessary.

It will be seen that the English receipt makes the rough-stuff much more elastic and durable than the American rough-stuff, mixed with all tub-lead, hard drying varnish, and brown Japan. Indeed the English painters are very seldom, if ever, troubled with the cracking of rough-stuff. I have rubbed down a coach which had been painted twenty years, and found the foundation in perfect condition. This is due to the elastic rough-stuff. As I see that the permanent wood filling is being introduced in this city, I think that the painters will find it necessary to add a little more wearing varnish to the first coat of rough-stuff, in order to make it sufficiently elastic for use over so elastic a priming.

In the next place, the London painter uses flatting varnishes which approach more nearly to the character of a finishing varnish than the American painter uses. He does not depend so much on his flatting coats for making the surface, but attains the surface before varnishing. We use the flatting coats merely to give fulness and lusture to the finishing coats, whereas we understand that our American confrères depend greatly on the heavy, hard-drying coats of rubbing varnish. It is this which so often causes the varnish on American coaches to part in long, brittle cracks, whereas, when the varnish on fine English coaches perishes, it generally does so in small cracks, which are not so easily discerned, and the coach still retains a good degree of brilliancy after years of use. The cracks occur in the finishing coats which have perished by exposure, and do not extend to the foundation. I would call the attention of your painters to English carriages which they may be called upon to renew, and would ask them to try scraping them down with a sharp plane iron or scraper. They will find that the varnish will scrape off in shavings, whereas if they try the same process on the rubbing coats of an American carriage, they will find the varnish to chip or pulverize under the scraper, similar to rosin, showing its brittle nature. *English painters seldom burn off a job.* They prepare the foundation with great care, and it generally remains perfect even after the varnish coats have perished, so that it is found necessary only to scrape down the varnish and rub down the color to the rough-stuff, to *find a perfect foundation upon which to repaint.*

America does not give sufficient attention to durability. I have learned this from two sources; I conversed with several American painters who were here at the Exposition of 1862, and several years ago I imported some rubbing varnish from New York and gave it a trial, and I found it too quick drying and brittle for use on any fine carriage. It is of just as much importance that the flatting coats of varnish be durable as that the finishing coats should be, for they are so intimately connected that the want of elasticity in the former will soon tear the latter apart. As the American painters progress in this branch of industry, as they progress in all, they will appreciate this point more and more, and as they attain toward perfection I feel that they *must use more elastic flatting varnishes.* LONG ACRE.

LONDON, March, 1870.

THE LAST "TECHNOLOGIST" contains a long and excellent article on the present state of varnish manufacture in the United States. It says: "English coach varnish, until recently, has had a decided preference over the American, on account of its durability and elasticity; but at the present time the American wearing body varnish is made so perfectly that it is used in our best carriage and railroad shops, *and the time is near at hand when the foreign article will be entirely superseded.* A very laudable strife among our varnish makers has been to see who should make the most durable varnish for coach work, and to produce a better article than that made abroad. Yankee ingenuity and perseverance is obtaining its reward, and consumers feel that it is their duty, as well as their interest, to use home products in place of foreign; and this cordial and hearty support has given increased incentive to American manufacturers to bring the article up to the required standard."

THE NEW YORK TRIBUNE, with its accustomed interest in any movement that shall tend towards making this country self-supporting, touched upon the varnish question in its issue of October 8th as follows: "A word about coach varnish may not be out of place here. As is well known to the trade, English varnish has always been the standard in this country; but American enterprise is beginning to assert itself, and we are glad to learn from manufacturers that the Valentine varnish has become established in most of the carriage factories in this city. Better quality is an even surer protection for home manufacturers than any protective tariff."*

Coach Varnishes.

The Different Grades.

Coach varnishes are divided into two leading classes, namely: the *levelling varnishes* (called "flatting" by the English, and "rubbing" by many American makers) and the *finishing varnishes.*

The purpose of the levelling or rubbing varnish is indicated by its name. It is applied with the intention that it be *rubbed down*, that thus the surface may be *levelled.* From this, it will be seen that the term *levelling* is in this case preferable to *rubbing* varnish. The former expresses the ultimatum for which the varnish is intended, while the latter denotes the means only. The surface being attained by the levelling varnish, the purpose of the finishing varnish is to give gloss, fine finish, and durability.

A levelling varnish differs from the finishing, in manufacture, in that it contains less oil and a greater proportion of gum. This variation causes it to dry quicker and harder than the finishing coat, and although less calculated to resist the action of moisture and acids, and less durable in every respect, the varnish so made will rub down much better and produce a more even surface than would be possible if a finishing varnish were used for the purpose. A fine finishing varnish dries and hardens slowly, and even after being well dried and hardened, it will work very poorly if one attempts to rub it down, and it will be liable to sweat out again.

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* The writer might justly have added that to the beneficent effects of a protective tariff is due the fact that we have at last reached that point in the manufacture of varnishes when we can furnish that "better quality," which "is an even surer protection for home manufacturers than any protective tariff." Protection, decided and for a few years steadily continued, uniformly leads to good quality and such prices as eventually defy destructive competition by the British and other enemies of our diversified industries—foreign competition being the one and only impediment to excellence in every important industry we undertake.

H. C. B.

The exact differences between a levelling and finishing varnish can be best illustrated by pointing out the several qualities which belong to each. In the circulars published by Valentine & Co., they enumerate the qualities existing in coach varnishes, as follows :—

1. Uniformity.
2. Paleness.
3. Fluency. This quality is predominant in finishing.
4. Reliability. “ “ “ “ “ levelling.
5. Drying. “ “ “ “ “ “
6. Hardening. “ “ “ “ “ “
7. Fulness. “ “ “ “ “ finishing.
8. Brilliancy. “ “ “ “ “ “
9. Durability. “ “ “ “ “ “

With this view before us, we shall be able to explain more distinctly why there are so many kinds of varnishes. We next take the price list of the same manufacturers, and on it we find that the following varieties of coach varnish are enumerated :—

Levelling, {
- Quick levelling,
- Elastic levelling,
- Hard drying body,
- Black body.

Finishing,
Wearing body,
Medium drying,
One-coat coach,
Elastic gear.

At first it appears as if this list were unnecessarily long, but if we examine it further, we find that each article has a definite and distinct use.

Nearly every carriage maker needs two levelling varnishes one for hurried work and one for slow, or one for work of medium quality and one for the best work, or one for his repair jobs and one for his new work. The quick levelling answers for one of these classes, the elastic levelling for the second class. The hard drying body stands half way between a levelling and a finishing varnish, and it is particularly convenient to many builders from the fact that it can be used for either purpose, as occasion requires. The black body is invaluable for jobs required to be black, as it dispenses with most of the paint, and gives a greater depth and richness of color than would be possible with any black pigment.

For a finishing coat on bodies, there are two grades of varnish, as there are two leading grades of levelling, or just as painters generally have two sets of varnish brushes for applying the same. The wearing body is for best work, and the medium drying for new work, on which it is not necessary to use an extremely durable article, and also on repair work which is hurried. Then comes the one-coat coach, which is especially adapted for finishing work when only a single coat is necessary. The list closes with elastic gear, which is the varnish for finishing the wheels and underparts of carriages.

Carriage makers often complain that there are so many kinds of varnish that they do not pretend to know anything about "what is what," and this is a very fruitful source of trouble with painters when trying varnishes of American make. They use the wrong grade, which is unfitted for the class of work for which they desire it, and then complain that it is bad varnish. They should remember that these varieties are made for their own convenience, and not for that of the manufacturer, who would much prefer to keep one grade only, and when testing a varnish, they should always be sure, in the first place, that they have obtained the variety which was intended for their wants. If it was not so intended, a rejection of the entire list from failure with this article is manifestly unjust.

Masury's Fine Colors for Coach and Carriage Painters, and Ornamental Car Work.

Our work would seem hardly complete without some reference to the improvements in the mode of preparing colors for the use of the coach painter, made by Mr. Masury, of New York, the successor to the old house of Masury & Whiton. Mr. Masury's experience extends over a period of thirty-five years, and is more comprehensive perhaps than that of any other man in the United States, in the business of preparing colors especially adapted to the various wants of the different branches of the painter's craft.

It is not generally known, we suppose, that all colors intended for artists' use, known as tube colors, are ground by the old slow tedious process of hand labor, with slab and muller.

Some years since, Mr. Masury expressed the intention to produce a perfect paint mill; one that should grind colors of all kinds finer than they can be ground by slab and muller, and that, too, without the heretofore unavoidable heating of the mixtures. This was expressed in the face of the discouraging fact, that numberless attempts had been made in all the principal countries in Europe, as also in our own country, without any approach to encouraging success.

The following statement of results produced by the new invention will show how far the expectations of the inventor have been realized. By the new process, the question of fineness is in no degree affected by the nature of the substances. All are reduced to an impalpably fine mass, more homogeneous than they can be made by any other known process. The list of colors produced by Mr. Masury, embraces all those used in the paint shop, from the purest carmine to rose pink, and from the finest French chrome yellow to plain yellow ochre, and all are ground to a like degree of fineness. Indian red, so indispensable in coach painting, and so intractable under the ordinary appliances of grinding, becomes under the new process, as fine as butter, and as smooth as enamel. A manufacturer of colored printing inks, while viewing, admiringly, some of the red alluded to above, said: "'Tis not a granular substance, but a solution." Mr. Masury claims that by his discovery and his plan of furnishing to the painter all his colors, ready for use, he relieves him of the drudgery and tedium of his profession. Colors just exactly suited to the requirements of the painter and the paint shop ready for use, must be considered a great desideratum. These colors, the blacks, carmines, lakes, etc., are ground in such fluids as experience has proved best suited to the peculiar natures of the various pigments; but all are ground with reference to drying quickly. Thus, the above-named colors will dry ready for varnish in an hour from the time they are put on, and two coats a day and varnish, can be applied to the work with perfect safety when the exigencies of the case require such haste. The object is to give to the painter the quickest drying colors possible, leaving it to his judgment and skill to temper them so as to meet the requirements of each particular case.

Mr. M. informs us that he has now nearly ready for distribution, a book containing samples of all the colors with a letter-press description of the best method of applying the same, and the proportions for the groundwork of each and every glazing color, and the author hopes to place a copy in the hands of every coach and carriage painter in the country. These paints are put up in packages of convenient size, and the fine colors, as carmine and lakes, are packed in cans or china jars, containing so little as two ounces; so that every painter, if disposed, may make a trial of the goods without any considerable outlay in the experiment. They are, we are assured, in use in the very best establishments in New York and elsewhere.

Whitelead.*

The production of whitelead until within a comparatively recent date was confined, almost exclusively, to Holland, and the Dutch system of corroding is recognized as the best. Its manufacture was first introduced, to any extent, into this country at the works of Mr. John Harrison, Philadelphia, the founder of the present well-known firm of Harrison Brothers & Co., manufacturing chemists, about the year 1806, though a Mr. Wetherill of that city had been successful in some practical experiments before that time.

The pig lead is melted in large iron pots, and from them the molten metal is run into a series of moulds, revolving on an endless chain. The lead is thus cast into what are called buckles, weighing about a pound each, flat and round and shaped like a grate to give a greater surface for the chemical action to which they are to be subjected. These buckles are placed in earthen pots, but kept from contact with the acetic acid with which the latter are charged, by means of projections made purposely in the pots, and upon which the buckles rest. The pots are then stacked up in what are known as beds—large frame structures, roofed in and provided with double walls—to the number of ten thousand or more. They are placed in layers with boards and tan between each, and piled up to the height of the building, the bottom of which and spaces between the walls all being padded with tan bark, till the whole is tightly shut in and the contents of the pots are left to the silent action of chemical laws. The tan generates heat, makes an oxide of the lead and vaporizes the acid, and with the carbonic acid formed in the decomposition of the tan, gradually reduces the metal to a beautiful snow-white substance. This result is only attained after an interval of ten to fourteen weeks, when, the beds being opened, the buckles are found thus transformed into carbonate of lead, or, more properly speaking, into a hydrated carbonate. From the beds it is taken to long revolving screens, through the meshes of which it falls into bins prepared for its reception, and any uncorroded particles of metal are separated and returned to the melting caldrons. The pots on being taken out contain no acid, and the lead has increased considerably in bulk and weight. By day and night, chemistry, that mysterious agent, has silently been doing its appointed task and producing by a strange and unseen process.this interesting and beautiful result.

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* Prepared by David C. Lloyd.

The lead, after having passed through the separating screens, is first thoroughly washed to deprive it of any free acetic acid, stain, or impurities, and is then ground in water between heavy burr-stone mills into a fine pulpy mass; this is then gathered and pumped upon drying pans in the kiln house. Deprived by this means of its water, the product of these manifold processes becomes the pure dry whitelead of commerce.

This dry or carbonate of lead is then kneaded with a suitable quantity of linseeed oil, generally in the proportion of eight pounds of oil to one hundred of lead, by means of what are called machine mixers, and, on being thoroughly mixed, the pasty mass descends through hoppers provided for the purpose, on to a lower floor of the mill house, and is there, in the best establishments, passed through a first mill, which again passes or feeds it into another, and, after grinding there, it is discharged into large tubs, where it should remain some time before packing into kegs or cans for the trade.

Notwithstanding the great number of so-called whitelead manufacturers existing in the United States, the majority have no real claims to be called such, and are so in name only. Its production constitutes a most important branch of industry; but one, which, owing to the large capital requisite and the length of time required before even the finished article can yield return, only a few large firms are engaged in it. Much interest is attached to the various processes we have described, but there is still a very general ignorance of the subject.

The only actual corroders of lead, doing business in New

York, given not in order of precedence, but alphabetically, are :—

Battelle & Renwick,
Hall, Bradley & Co.,
Harrison Brothers & Co.,
The Atlantic Whitelead Co.,
The Brooklyn " "
The Union " "
J. Jewett & Sons.

In Philadelphia :—

Harrison Brothers & Co.,
John T. Lewis & Brothers,
Wetherill & Brother.

Boston, Pittsburg, Baltimore, and St. Louis and other large cities each contains one or more firms who are actual corroders.

There is much rivalry as to the merits and demerits of these various brands; but it is more among the consumers than the corroders themselves. The latter are, as a class, conservative, and look quietly on, fully satisfied that there is room enough for all. The former vaunt the particular brand they have been accustomed to use and constitute themselves its zealous champions, although they know nothing, probably having never tried the merits of the others. The truth is that prejudice has more to do with this favoritism than merit. There may be slight differences in mode of preparation, washing, and grinding; but they are all good; and all, as we have said, undoubtedly *pure*, so that the consumer is safe in selecting either make.

One brand will have the preference and almost exclusive sale in one section of the country and be almost unknown in another. The oldest and among the most widely distributed is that of *Harrison Brothers & Co.*, and we have been told. it is usual with some parties, who are about having painting done and are particular as to the work, to insert in their contracts that only this brand of lead shall be employed; but the preference so often given to it is not due to a degree of purity over the others, as all are pure; but merely to the extreme and peculiar care given to it while passing through the various stages of washing, drying, grinding, and preparing for the market, the result of an experience of over *sixty* years devoted to the business. From what we have said it will be apparent to procure good work and satisfactory results from the use of whitelead it is of the first importance that material *known* to be good should be employed. The painter should, for his own sake, purchase nothing else, and the owner of property should for the same reasons, permit this only to be used upon his work. If lead is to be employed let those requiring painting done stipulate, for their own protection, either by bargain or contract, what the brand shall be and thus guard against the employment of a pigment, which, by being perhaps only second rate, may cause the work speedily to require re-doing. In conclusion, we may add that all strictly pure leads are about the same in price, and if not kept in stock by local dealers can always be procured by such, so that there is no reason why any one should be restricted to any particular brand against his wish or taste.

WAR DEPARTMENT
LIBRARY

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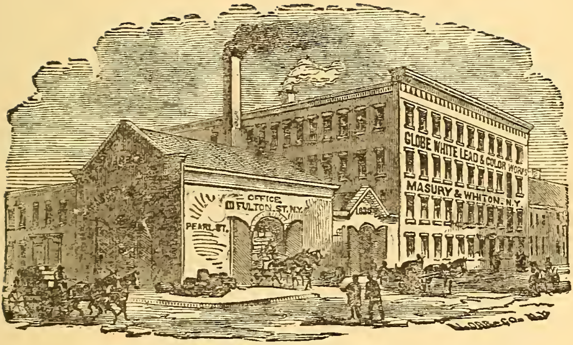
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Drop Black for priming coat ground in best Japan.

Price per pound in assorted cans	25 cents.
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All the above-mentioned qualities and kinds of black we furnish ground in drying-oil at a price five cents per pound less than for the same article in Japan, except the last named; the price of which is two cents less in drying-oil than in Japan.

Pure (No. 40) Carmine, B.

This color is warranted strictly pure, and to contain as great a percentage of coloring matter as any manufactured. It is ground so as to dry (when thinned with clear turpentine) ready for varnish in about one hour, in a temperature of about 70 degrees. It is put up in our patent cans, in quantities of a pound and more down to two ounces, and is sold at the following prices:—

In 1 pound cans, per pound . . .	$11 00
In ½ “ “ “ “ . . .	11 00
In ¼ “ “ “ “ . . .	11 50
2 ounces, at per ounce	75

In case this color works too quickly it can of course be made slower (to suit) by the addition of a small quantity of raw linseed oil; and these remarks will apply to all the colors in the list.

Scarlet Lake.

Of this Lake we have three qualities which are distinguished by the letters A, B, and C, respectively, the last letter designating the best or highest price. These colors are ground the same as the Carmine, and will dry, thinned with clear turpentine, in about an hour.

Scarlet Lake, C, per pound. in 1 lb. cans . . .	$6 50
" " " " " ½ " " . . .	6 50
" " " " " ¼ " " . . .	6 75
" " " per ounce " 2 oz. " . . .	50
Scarlet Lake, B, per pound, in 1 lb. cans . . .	5 50
" " " " " ½ " " . . .	5 50
" " " " " ¼ " " . . .	5 75
" " " per ounce " 2 oz. " . . .	40
Scarlet Lake, A, per pound, in 1 lb. cans . . .	4 50
" " " " " ½ " " . . .	4 50
" " " " " ¼ " " . . .	4 75
" " " per ounce " 2 oz. " . . .	35

Purple Lake.

Purple Lake (English superfine), per pound, in 1 lb. cans	7 00
Purple Lake (English superfine), per pound, in ½ lb. cans	7 00
Purple Lake (English superfine), per pound, in ¼ lb. cans	7 25
Purple Lake (English superfine), per ounce, in 2 oz. cans	50

Purple Lake (English), deep and extra deep, B, per pound, in 1 lb. cans	5 00
Purple Lake (English), deep and extra deep, B, per pound, in ½ lb. cans	5 00
Purple Lake (English), deep and extra deep, B, per pound, in ¼ lb. cans	5 25
Purple Lake (English), deep and extra deep, B, per ounce, in 2 oz. cans	40

Munich Lake.

Munich Lake, A, per pound, in 1 lb. cans	3 25
“ “ “ “ “ “ ½ “ “ . . .	3 25
“ “ “ “ “ “ ¼ “ “ . . .	3 50
“ “ “ “ ounce “ 2 oz. “ . . .	30
Munich Lake, B, per pound, in 1 lb. cans	4 50
“ “ “ “ “ “ ½ “ “ . . .	4 50
“ “ “ “ “ “ ¼ “ “ . . .	4 75
“ “ “ “ ounce “ 2 oz. “ . . .	35

Carmine Lake.

Carmine Lake, A, per pound, in 1 lb. cans . .	2 50
“ “ “ “ “ ½ “ “ . .	2 50
“ “ “ “ “ ¼ “ “ . .	2 75
“ “ “ ounce, “ 2 oz. “ . .	25
Carmine Lake, B, per pound, in 1 lb. cans . .	3 50
“ “ “ “ “ ½ “ “ . .	3 50
“ “ “ “ “ ¼ “ “ . .	3 75
“ “ “ ounce, “ 2 oz. “ . .	30

Crimson Lake, etc.

Crimson	Lake,	A,	per pound,	in	1	lb. cans	1 50
“	“	“	“	“	½	“	1 50
“	“	“	“	“	¼	“	1 75
Crimson	Lake,	B,	per pound,	in	1	lb. cans	2 00
“	“	“	“	“	½	“	2 00
“	“	“	“	“	¼	“	2 25
Yellow	Lake,	A,	per pound,	in	1	lb. cans	2 00
“	“	“	“	“	½	“	2 00
“	“	“	“	“	¼	“	2 25
“	“	B,	“	“	1	“	2 50
“	“	“	“	“	½	“	2 50
“	“	“	“	“	¼	“	2 75
Green	“	“	“	“	1	“	3 00
Carmine Brown					1	“	
Rose Pink,			“	“	1	“	50
Dutch Pink			“	“	1	“	50

Body Colors.

These colors will dry (ready for varnish) thinned with turpentine in from three to four hours. Thinned with Japan they will dry in about one hour. They are warranted perfectly pure, and, we commend them as being the cheapest colors in market at whatever price, because of their fineness and body.

Chrome	Yellow,	French, in	1	lb. cans		1 25
“	“	Pure C.P.	1	“	Light	50
“	“	“ “	1	“	Medium	50
“	“	“ “	1	“	Orange	50
“	“	“ “	1	“	Deep Orange	50
Naples	“		1	“		1 25
Milori Green						1 25

Coach painters' Green, Light, in 1 lb. cans and upwards	50
Coach painters' Green, Medium, in 1 lb. cans and upwards	50
Coach painters' Green, Dark, in 1 lb. cans and upwards	50
English Vermilion, Deep (or Crimson) per lb.	1 50
" " Light (or Scarlet) "	1 50
" " Ext. Deep "	1 50
Am. or Imitation Vermilion, Light and Deep, per lb.	50
Tuscan Red, per lb.	50
Indian Red, best English, very fine, per lb.	40
Royal Red, a bright Red of dense body, per lb.	25
Ult. Marine Blue, per lb.	1 00
" " " A.	75
Van Dyke Brown (Genuine), very rich color, in 1 lb. cans	45
Burnt Sienna (best Italian), rich and glowing	37
Raw " " " "	37
Burnt Umber (from Turkey), very fine	35
Raw " " "	35
Silver White, per lb.	25
" " Jap. Gold Size per lb.	40
White Lead, extra fine, in Drying-oil	—
Extra Coach Japan, per gallon	—
Japan Gold Size	—

It will be understood that these colors *do not become fatty* by standing, nor do they *skin over* when *kept from the air*. If care be taken to keep a broken package air tight, the color will remain unchanged for any length of time; but, when spread on the work, the quick colors (as Blacks, Carmines, and Lakes) dry in ten or fifteen minutes. All Lakes used by coach painters, not named in this list, may be had on application. Our colors are now in use by many of the leading coach and carriage houses in New York, New Haven, Boston, Philadelphia, Portland, and elsewhere. We could give numberless certificates, but prefer that every man shall test the goods for himself.

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